



KLM STEEL PIPE

บริษัท รวมกิจ อินเตอร์เนชั่นแนล จำกัด

มุ่งมั่นที่จะพัฒนาการเป็นผู้นำในธุรกิจการกระจายสินค้าประเภทโลหะ เพื่อตอบสนองความต้องการของลูกค้าอย่างมีคุณภาพตลอดไป

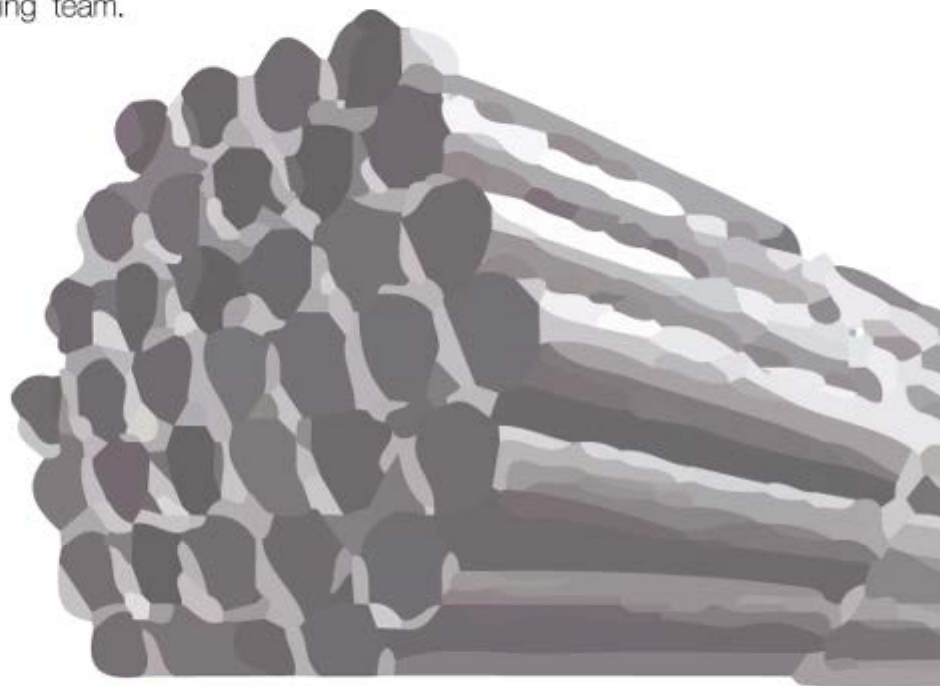
Ruamkij is engrossed in to the leader and development of metal business, for meet the requirement of a customer of good quality forever.

เป็นผู้จัดจำหน่าย และ นำเข้าผลิตภัณฑ์คุณภาพประเภทท่อเหล็กชนิดต่างๆ เช่น ท่อเหล็กดำ ท่อเหล็กไร้ตะขี้บ ท่อชุบสังกะสี ท่อทองแดง เป็นต้น รวมทั้งอุปกรณ์ และ เหล็กรูปพรรณอื่นๆ จากโรงงานชั้นนำและได้มาตรฐานทั้งในและ ต่างประเทศสำหรับใช้ประโยชน์ในงานด้านต่างๆ เช่น งานอุตสาหกรรมก่อสร้างทั่วไป งานทางด้านสาธารณูปโภค งานประปา ฯลฯ

บริษัท รวมกิจ อินเตอร์เนชั่นแนล จำกัด ก่อตั้งขึ้นในปี พ.ศ.2535 โดยกลุ่มผู้บริหารที่มีประสบการณ์และมีความชำนาญในธุรกิจเหล็กมาเป็นเวลานาน ตลอดระยะเวลาที่ผ่านมา บริษัทฯ ตระหนักถึงความสำคัญของการจัดจำหน่ายสินค้าที่ได้มาตรฐาน การบริการที่รวดเร็ว ตรงต่อเวลา เพื่อตอบสนองความต้องการของตลาดที่แท้จริง เพื่อให้ลูกค้าได้รับความพึงพอใจสูงสุด โดยทั้งงานฝ่ายขาย ฝ่ายการตลาด และ ฝ่ายจัดส่ง ก็พร้อมจะตอบสนองความต้องการของลูกค้าตลอดไป

Ruamkij International Co.,Ltd. is the distributor and importer of all kinds of standard steel pipes i.e. black steel pipes, seamless steel pipes, galvanized steel pipes, copper pipes etc. including the accessories from the leading standardize manufacturers both in Thailand and from overseas, to serve the various requirements of the construction sectors for industrial and general structures, public utility and water transmission words, etc.

The company was established in 1992 by a management team who had very good experience in this business field. We emphasize on the quality and international standard of the products to meet the requirements of the markets, with the most efficient systems to serve our customers by the well-trained sale people and marketing team.





Certificate



 University of Toronto Faculty of Arts and Social Sciences		Page No.
Question (10 marks)		Date: / /
Answer (10 marks)	Answer:	
Introduction (10 marks)	Answer:	
Body (10 marks)	Answer:	
Conclusion (10 marks)	Answer:	
References (10 marks)	Answer:	
Appendix (10 marks)	Answer:	
Summary (10 marks)	Answer:	
Conclusion (10 marks)	Answer:	

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Figure 1 Schematic diagram of the experimental setup for the study of the effect of the concentration of the solution on the rate of the reaction.

The diagram illustrates the experimental setup for measuring the rate of reaction. It consists of a reaction vessel (a) containing a solution of a reactant. A gas inlet (b) and outlet (c) are connected to the vessel. The gas outlet is connected to a gas syringe (d) via a delivery tube (e). The gas syringe is graduated in cm³. The reaction is initiated by adding a catalyst (f). The concentration of the solution is varied by changing the volume of the solution (g) and the volume of water added (h). The rate of reaction is determined by measuring the time taken for a fixed volume of gas to be evolved (i). The diagram is labeled with various components and variables.

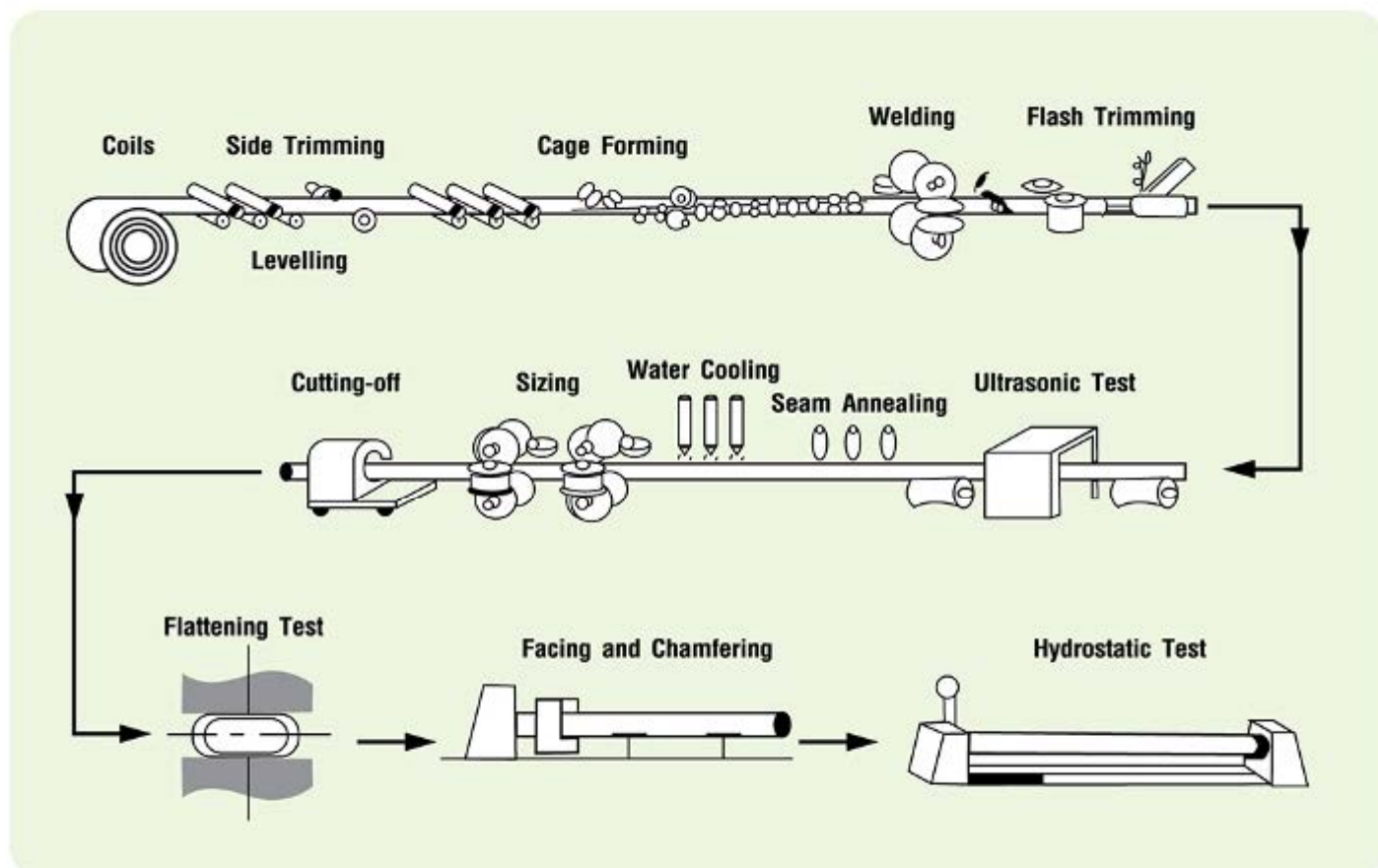
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Figure 1 consists of four sub-images arranged in a 2x2 grid, illustrating the experimental setup for measuring the thermal conductivity of a polymer. The top-left image shows a cross-section of a polymer sample with a thermocouple inserted. The top-right image shows a pressure gauge. The bottom-left image shows a thermocouple connected to a data logger. The bottom-right image shows a pressure gauge connected to a data logger.

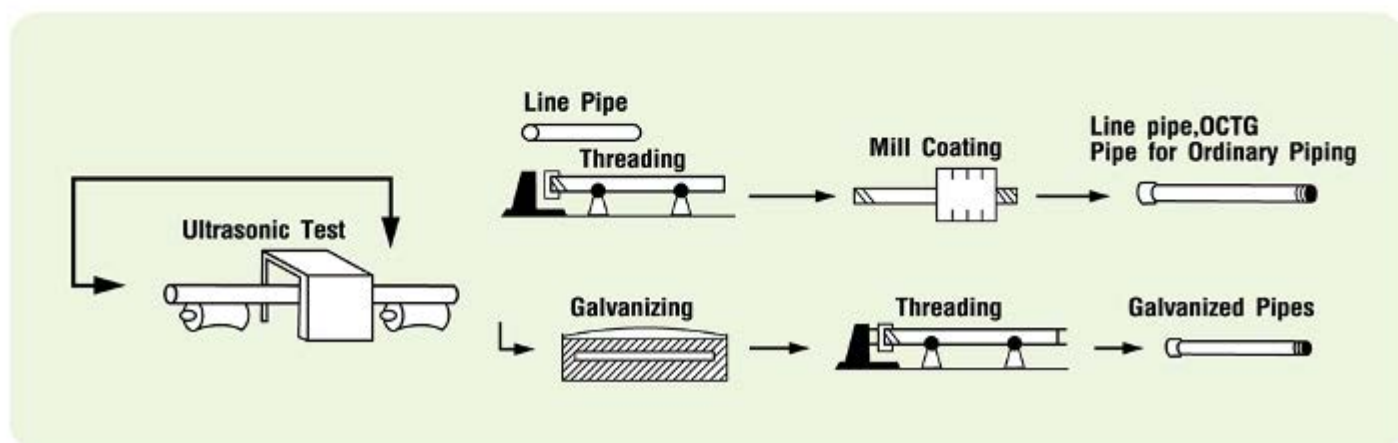
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MANUFACTURING PROCESS



TESTING & GALVANIZING PROCESS



Quality Control



Metallogical Test

ทดสอบคุณสมบัติทางกล



Digital Loadcell Test

ทดสอบแรงดึง



Spectrometer Test

ทดสอบคุณสมบัติทางเคมี



Hydrostatic Test

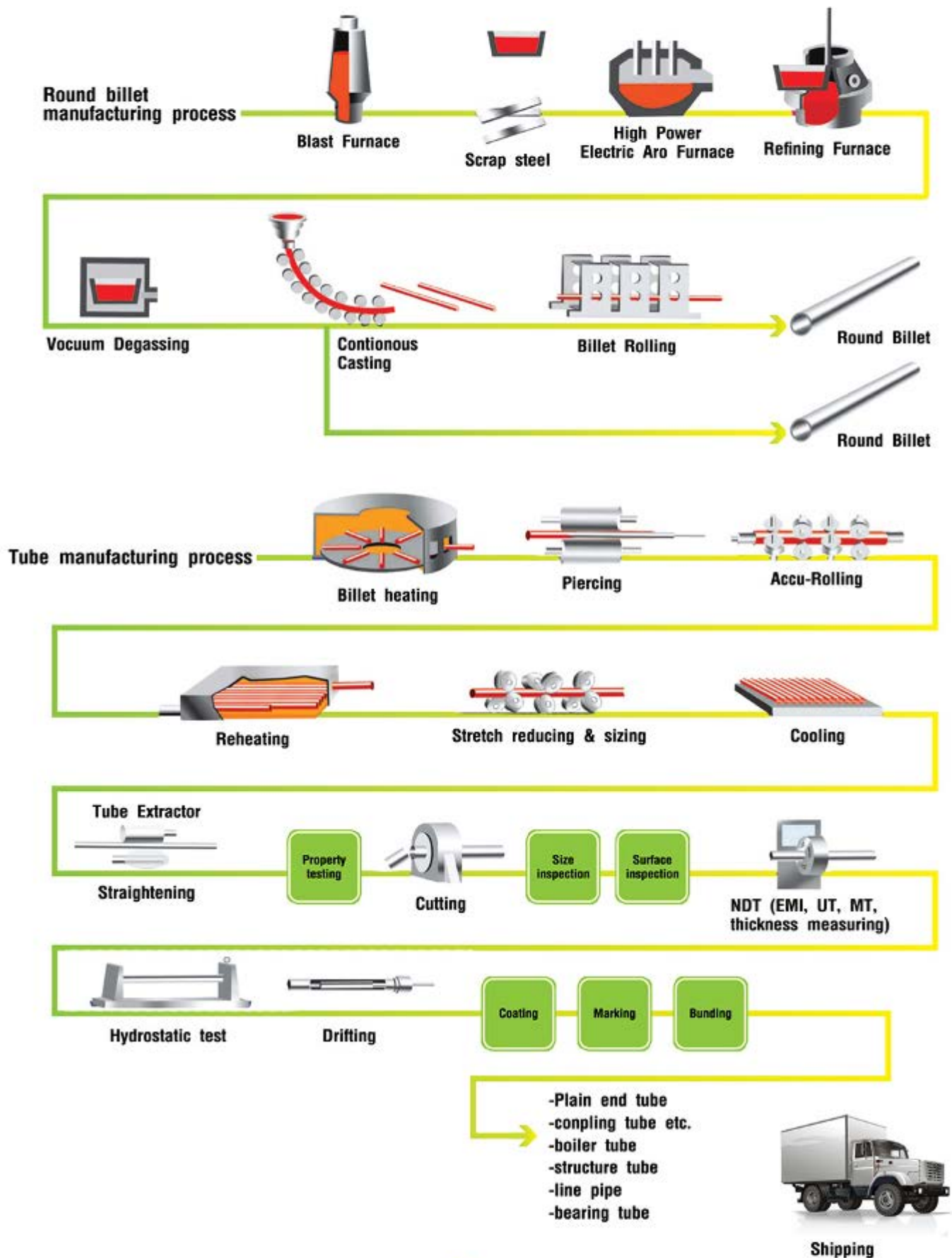
ทดสอบการรั่วซึมด้วยระบบน้ำแรงดันสูง

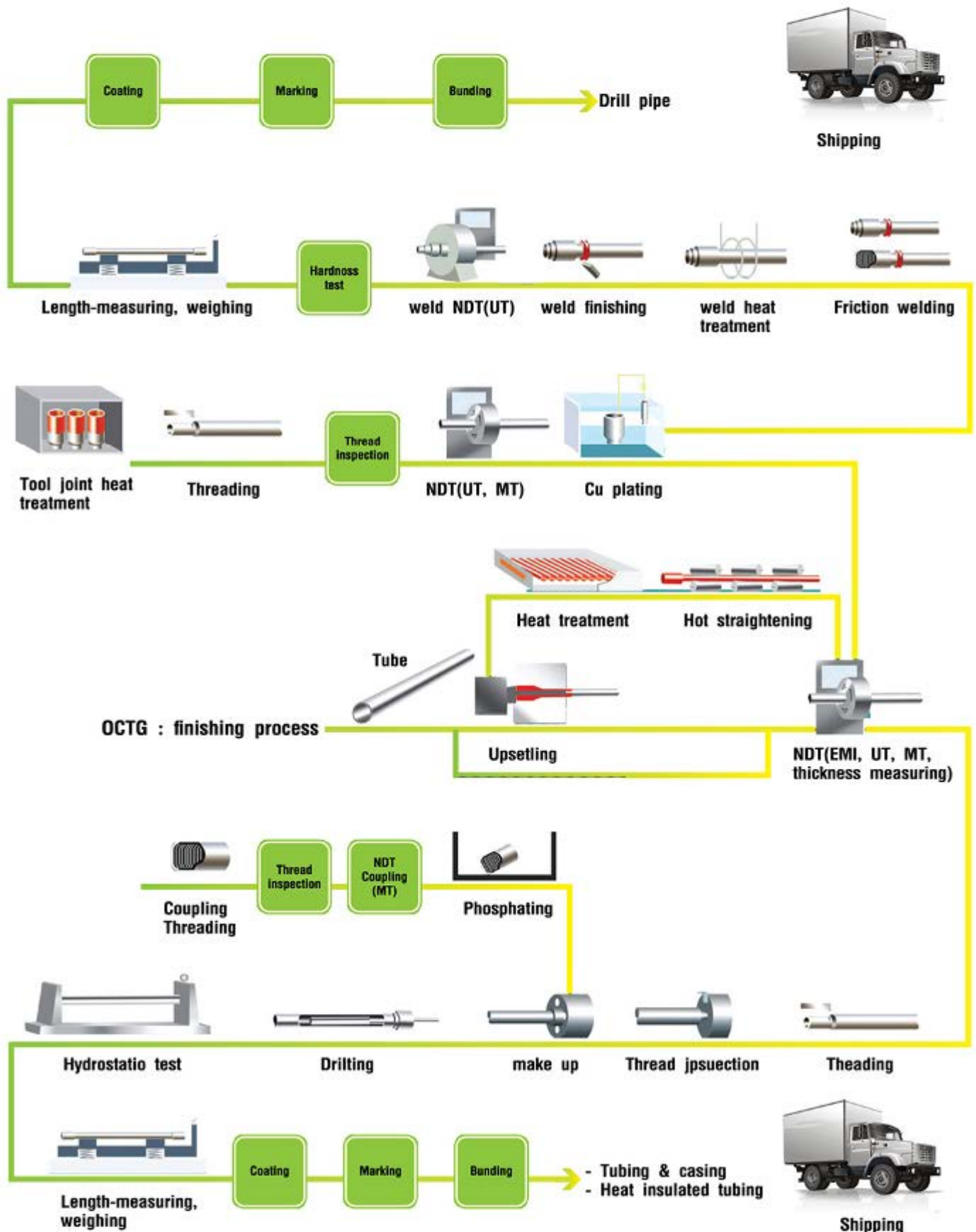


SEAMLESS PROCESS



Process Flow





Type of pipes		Similar specification				Application
Type	Manufacturing method	Korea	Japan	U.S.A.	U.K	
Steel pipes for ordinary piping	ERW	Carbon steel pipes for ordinary piping (KS D 3507/SPP)	Carbon steel pipes for ordinary piping (JIS G 3452/SGP)	ASTM A53	BS 1387	Steel pipes for steam, air, water, oil and gas etc. with relatively low pressure
	ERW	Galvanized steel pipes for water service (KS D 3537/SPPW)	Galvanized steel pipes for water service (JIS G 3442/SGPW)	ASTM A53	BS 1387	Steel pipes for water supply with 100m or less at water head
	ERW Spiral Roll bending	Coated steel pipes for water works (KS D 3565/STWW) Fittings of coated steel pipes for water works (KS D 3578)	-	AWWA C200, C203	-	Steel pipes for water works
	Spiral Roll bending	Arc welded carbon steel pipes (KS D 3583/SPW)	Arc welded carbon steel pipes (JIS G 3457/STPY)	ASTM A 134, A139 A671, A672	-	Steel pipes for steam, air, water, oil and gas etc. with relatively low pressure
Steel pipes for pressure service	ERW	Carbon steel pipes for pressure service (KS D 3562/SPPS)	Carbon steel pipes for pressure service (JIS G 3454/STPG)	ASTM A53 API 5L	BS 3601	Steel pipes for application at a temperature of 350 C or less
	Roll bending	Arc welded carbon steel pipes (KS D 3583/SPW)	Arc welded carbon steel pipes (JIS G 3457/STPY)	-	-	Piping for steam, water, gas, air of comparatively low working pressure.
Steel pipes for structural purposes	ERW	Carbon steel tubes for machine structural purposes (KS D 3517/STKM)	Carbon steel tubes for machine structural purposes (JIS G 3445/STKM)	ASTM A513	BS 980 BS 1717 BS 1775	Steel pipes for application for mechanical Parts such as machinery, automobiles, bicycles, furniture and fixtures etc.
	ERW Spiral Roll bending	Carbon steel tubes for machine structural purposes (KS D 3566/STK)	Carbon steel tubes for general structural purposes (JIS G 3444/STK)	ASTM A500	BS 980 BS 1139 BS 4848	Steel pipes for application for structures such as civil works, architecture, steel tower, scaffolding, piles, veranda and fence and post etc.
	ERW	Carbon steel square pipes for general structural purposes (KS D 3568/SPSR)	Carbon steel square pipes for general structural purposes (JIS G 3466/STKR)	ASTM A500	BS 4848	Steel pipes for application to civil works, architecture and other structures
	ERW Spiral Roll bending	Steel pipe piles (KS F 4602)	Steel pipe piles (JIS A 5525/SKK)	ASTM A252	-	Steel pipes for foundation civil works, architectures etc.
	Spiral Roll bending	-	-	Fabrication of structural steel pipe (API 2B)	-	Offshore structure. Piping and main structural members
Line pipe	Spiral Roll bending	-	-	API 5L (GR, A, B, X42, X46, X52 X56, X60, X65, X70, X80)	-	Steel pipes for transportation petroleum and natural gas
OCTG	ERW	-	-	API 5CT (H40, J55, K55, N80)	-	Steel pipes for development for petroleum and natural gas
Conduits	ERW	Rigid steel conduits (KS C 8401)	Rigid steel conduits (JIS C 8305)	ANSI C80.1 UL6	BS 31	Steel pipes for protection of electric cable at electric distribution lines
Steel tubes for boiler & heat exchanger	ERW	Carbon steel boiler and heat exchanger tubes (KS D 3563/STBH)	Carbon steel boiler and heat exchanger tubes (JIS G 3461/STB)	ASTM A 178, A 214, A 226	BS 3059 BS 3606	Water pipes for boiler, connection pipe, overheat engine, air preheating pipe and heat exchange pipes, condenser
Coated steel pipes	ERW Spiral Roll bending	-	-	-	-	Coated steel pipes for protection of outside surface of steel pipe for underground burial.
Steel tubes for tower structural purposes	ERW Spiral Roll bending	-	-	-	-	High tensile steel pipes applicable to electric transmission tower

KS : Korean standards JIS : Japanese Industrial Standards BS : British Standard API : American Petroleum Institute UL : Underwriters Laboratories

AWWA : American Water Works Association ASTM : American Society for Testing and Materials UK : United Kingdom

* Please consult dimension of main pipes produced with market department.

SPECIFICATIONS



Specification		ASTM A53		ASTM A500				ASTM A513										
		A	B	A		B		MT 1010	MT 1015	MTX 1015	MT 1020	MTX 1020	1025	1026	1030	1035	4130	8630
Classification		Ordinary piping		General structural purposes				Machine structural purposes										
Application		Ordinary piping		General structural purposes				Machine structural purposes										
Chemical composition (%)	C(Max.)	0.25	0.30	Heat 0.26	Product 0.30	Heat 0.26	Product 0.30	0.05-0.15	0.10-0.20	0.10-0.20	0.15-0.25	0.15-0.25	0.22-0.28	0.22-0.28	0.27-0.34	0.31-0.38	0.28-0.33	0.28-0.33
	Si(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15-0.35	0.15-0.35
	Mn(Max.)	0.95	1.20	-	-	-	-	0.30-0.60	0.30-0.60	0.60-0.90	0.30-0.60	0.70-1.00	0.30-0.60	0.60-0.90	0.60-0.90	0.60-0.90	0.60-0.90	0.70-0.90
	P(Max.)	0.05	0.05	0.035	0.045	0.035	0.045	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
	S(Max.)	0.045	0.045	0.035	0.045	0.035	0.045	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.040	0.040
	Other	-	-	Cu 0.20 (Min.)	Cu 0.18 (Min.)	Cu 0.20 (Min.)	Cu 0.18 (Min.)	-	-	-	-	-	-	-	-	-	-	-
Mechanical Properties	Tensile strength (Min.)	PSI	48000	60000	R 45000	S 45000	R 58000	S 58000	AS-welded	1010 1015 1020 1025 1030 1035	45000 48000 52000 56000 62000 66000	32000 35000 38000 40000 45000 50000	Yield point Min. (PSI)	25000 30000 35000 37000 40000 45000	Elongation Min(%)	15 15 13 12 10 10		
		MPa	330	415	310	310	400	400										
		kgf/mm ²	33.8	42.2	31.6	31.6	40.8	40.8										
	Yield point (Min.)	PSI	30000	35000	33000	39000	42000	46000	Normalized	1010 1015 1020 1025 1030 1035	40000 45000 50000 55000 60000 65000	25000 30000 35000 37000 40000 45000	Elongation Min(%)	30 30 25 25 25 20				
		MPa	205	240	228	269	290	317										
		kgf/mm ²	21.1	24.6	23.3	27.4	29.6	32.3										
	Elongation (Min.)	e = 625000 [1940]A ^{0.2} /U ^{0.9}	25 (56t + 17.5)	23 (61t + 12)	Mandrel-drawn	1010 1015 1020 1025 1030 1035	60000 65000 70000 75000 85000 90000	50000 55000 60000 65000 75000 80000	Elongation Min(%)	5 5 5 5 5 5								
											Mandrel-drawn stress-relieved	1010 1015 1020 1025 1030 1035	55000 60000 65000 70000 80000 85000	45000 50000 55000 60000 70000 75000	Elongation Min(%)	12 12 10 10 10 10		
	Flattening test	H : Distance between flattening plates (mm) H : Inside distance between flattening plates(mm) D : Outside diameter of the pipe (mm) D : Inside diameter of the pipe (mm) T : Wall thickness of the pipe (mm)	NPS2 over Weld H = 2/3D Base metal H = 1/3D	Weld H = 2/3D Base metal H = 1/3D Soundness Test H = Contact Welded part is located at 90 degree	Welded part H = 2/3D Base metal H = 1/3D Welded part is located at 90 degree													
		Bending angel X Inside radius (D : Outside diameter of the pipe)	NPS2 below 90 x 12D close coiling 180 x 8D															
	Hydrostatic test	P : Test pressure (PSI, MPa) D : Outside diameter (mm) t : Thickness (mm)	P- 2St D		P = 2St D S = allowable fiber stress of 14000PSI or 96.5MPa													
		NDT (Non-Destructive Test)	Ultrasonic Test or Eddy current test		Eddy - Current Test or Ultrasonic Test or Flux leakage Test													
	Others		Weight of zinc coating Average : Min. 550 g/m2 Individual : Min. 490 g/m2		Flaring Test ID' = 1.15D' (60 tool) D' : Inside diameter ID' : Enlarged inside diameter													

Specification Classification			ASTM A589				BS 1387	BS 3601			BS 3602		BS 1775																	
			TYPE 1		TYPE 2	TYPE 3	TYPE 4	(L) Light (M) Medium (H) Heavy	ERW 320	ERW 360	ERW 430	ERW 360	ERW 410	ERW 11	ERW 16	ERW 20	ERW 23													
Application			Drive Pipe (Grade A)	Drive Pipe (Grade B)	Water-Well Reamed and Drilled Pipe (Grade A)	Driven Well Pipe (Grade A)	Water-Well Casing Pipe (Grade A)	Ordinary piping	Pressure services			High-pressure services		Machine structural purposes, General structural purposes																
Chemical composition(%)	C(Max.)		-	-	-	-	-	0.20	0.16	0.17	0.21	0.17	0.21	-	-	-	-													
	Si(Max.)		-	-	-	-	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-													
	Mn(Max.)		-	-	-	-	-	1.20	0.30-0.70	0.40-0.80	0.40-1.20	0.40-0.80	0.40-1.20	-	-	-	-													
	P(Max.)		0.050	0.050	0.050	0.050	0.050	0.045	0.040	0.040	0.040	0.045	0.045	0.060	0.060	0.060	0.060													
	S(Max.)		0.060	0.060	0.060	0.060	0.060	0.045	0.040	0.040	0.040	0.045	0.045	0.060	0.060	0.060	0.060													
	Other		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Mechanical properties	Tensile strength (Min.)	PSI	48000	60000	48000		-	-	-	-	-	-	-	-	-	-	-													
		MPa	331	413	331		320-460	320-460	360-500	430-570	360-500	410-550	309	386	463	494														
		kgf/mm ²	33.8	42.1	33.8		32.7-46.9	32.7-46.9	36.7-51.0	43.9-58.2	36.7-51.0	41.8-56.1	31.5	39.4	47.2	50.4														
	Yield point (Min.)	PSI	30000	35000	30000		-	-	-	-	-	-	-	-	-	-	-													
		MPa	207	241	207		195	195	235	275	215	245	170	247	309	355														
		kgf/mm ²	21.1	24.6	21.1		19.9	19.9	24.0	28.1	21.9	25.0	17.3	25.2	31.5	36.2														
	Elongation(Min.)		e = 625.000(A02/U09)					20	25	25	22	24	22	600/TS(700/TS) TS : Ton/in ² ,Kg/mm ²																
Flattening test	H : Distance between flattening plates H : Inside distance between flattening plates D : Outside diameter of the pipe D : Inside diameter of the pipe T : Wall thickness of the pipe		-				DN Over 50 Welded part H = 0.75D Base metal H = 0.60D Welded part is located at 90 degree	H = $\frac{(1+e)t}{e+tD}$ <table><tr><th rowspan="2">Class</th><th colspan="2">Constant</th></tr><tr><th>Welded part</th><th>Base metal</th></tr><tr><td>320</td><td>0.029</td><td>0.10</td></tr><tr><td>360</td><td>0.026</td><td>0.09</td></tr><tr><td>460</td><td>0.023</td><td>0.08</td></tr></table>			Class	Constant		Welded part	Base metal	320	0.029	0.10	360	0.026	0.09	460	0.023	0.08	H = $\frac{(1+e)t}{e+tD}$ e = 0.10 e = 0.08		H' = 3t or H' = 1/2D whichever is the smaller H' = 6t or H' = 3/4D whichever is the smaller H' = 8t or H' = 7/8D whichever is the smaller H' = 8t or H' = 3/4D whichever is the smaller			
Class	Constant																													
	Welded part	Base metal																												
320	0.029	0.10																												
360	0.026	0.09																												
460	0.023	0.08																												
Bending test	Bending angle X Inside radius (D : Outside diameter, t : Wall thickness)		-				DN 50below Black pipes 180' x 60 Galvanized pipes 90' x 80	-			Outside diameter of bar is 4t		-																	
Hydrostatic test	P : Test pressure S : Fiber stress, PSI/(mPa) D : Outside diameter(mm) t : Thickness (mm)		Prescribed according to dimension and grade				51 (50 bar)	P = $\frac{20St}{D}$ (bar) S : 80% of the specified minimum yield strength			P = $\frac{20St}{D}$ (bar) S : 80% of the specified minimum yield strength Max 143Kg/cm ² (140bar)		-																	
NDT (Non-Destructive Test)			-				Eddy Current Test (substitut e with hydrostatic test)	Eddy Current Test (Applied to pipes with Outside diameter of 180 mm or less as substitution for hydrostatic test)			Ultrasonic Test		-																	
Others			-				Bore Test (hot-dip zinc coated tubes)	-			The Charpy V-notch Impact test		Drift Expanding Test 1D = 1.125D' 1D = 1.100D' 1D = 1.075D' 1D = 1.100D'																	

SPECIFICATIONS



Specification Classification			KS D 3507 (JIS G 3452)	KS D 3537 (JIS G 3442)	KS D 3565			KS D 3583 (JIS G 3457)	KS D 3562 (JIS G 3454)		KS D 3569 (JIS G 3460)	KS D 3570 (JIS G 3456)	
			SPP (SGP)	SPPW (SGPW)	STWW 290 (300A below)	STWW 370 (300A below)	STWW 400 (350A below)	SPW 400 (STPY 400)	SPPS 38 (STPG 370)	SPPS 42 (STPG 410)	SPLT 39 (STPL 380)	SPHT 38 (STPT 370)	SPHT 42 (STPT 410)
Name of specification			Carbon steel pipes for ordinary piping	Galvanized steel pipes for water service	Coated steel pipes for water works			Arc welded carbon steel pipes	Carbon steel pipes for pressure services		Steel pipes for low temperature services	Carbon steel pipes for high temperature services	
Chemical composition(%)	C(Max.)		-	-	-	0.25	0.25	0.25	0.25	0.30	0.25	0.25	0.30
	Si(Max.)		-	-	-	-	-	-	0.35	0.35	0.35	0.10-0.35	0.10-0.35
	Mn(Max.)		-	-	-	-	-	-	0.30-0.90	0.30-1.00	1.35	0.30-0.90	0.30-1.00
	P(Max.)		0.050	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.035	0.035	0.035
	S(Max.)		0.050	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.035	0.035	0.035
	Other		-	-	-	-	-	-	-	-	-	-	-
Mechanical properties	Tensile strength (Min.)	kgf/mm ²	30	30	30	38	41	41	38	42	39	38	42
		N/mm ²	294	294	294	373	402	400	373	472	382	373	412
	Yield point (Min.)	kgf/mm ²	-	-	-	22	23	23	22	25	21	22	25
		N/mm ²	-	-	-	216	226	225	216	245	206	216	245
	Elongation (Min.) (%)	No.11 specimen No.12 specimen	30	30	30	30	-	-	30	25	35	30	25
		No.5 specimen	25	25	25	25	18	18	25	20	25	25	20
Flattening test			H : Distance between Flattening plates(mm) D : Outside diameter of the pipe T : Wall thickness of the pipe(mm)	H = 2/3D	H = 2/3D	H = 2/3D (Electric resistance welded pipe)			-	Welded part H = 2/3D Base metal H = 1/3D		H = $\frac{(4+e)t}{e+t/D}$ e = 0.08	H = $\frac{(1+e)t}{e+t/D}$ e = 0.07
Bending test			Bending angle X Inside radius (D : Outside diameter of the pipe)	90° x 6D (pipes of 50A or brlow, substitute with flattening test)	90° x 8D (pipes of 50A or brlow)	-			-	90° x 6D (pipes of 40A or brlow, substitute with flattening test)	90° x 6D (pipes of 50mm or brlow, substitute with flattening test)	90° x 6D (pipes of 50mm or brlow, substitute with flattening test)	
Hydrostatic test			Test pressure (kgf/mm ²)	25	25	Letter symbol of grade		Test pressure	25	Schedule No. Test pressure		Schedule No. Test pressure	Schedule No. Test pressure
					STWW 290		25	10 20		10 20	10 20		
					STWW 370		35	20 35		20 35	20 35		
					STWW 400		A 25	30 50		30 50	30 50		
							B 20	40 60		40 60	40 60		
Non-destructive test			Ultrasonic test or eddy current test	substitute with hydrostatic test	substitute with hydrostatic test	substitute with hydrostatic test (Selection of one ultrasonic test, eddy current test, radiographic test)			substitute with hydrostatic test	substitute with hydrostatic test	substitute with hydrostatic test	substitute with hydrostatic test	
Others			Galvanized pipes (uniformity test5 times)	Weight of zinc coating (average 600g/m ²). uniformity test6 times	Tensile strength test for welded part (Arc welded steel pipes)			Tensile strength test for welded part	-		Charpy impact test	-	

Specification		API 5L (PSL I/PSL II)												API 5CT																														
		A25		A	B	X42	X46	X52	X56	X60	X65	X70	X80	H40	J55	K55	N80																											
Classification		Class 1	Class 2																																									
Application		Line pipe												Casing Tubing																														
Chemical composition (%)	C(Max.)	0.21	0.21	0.22	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26																															
	Si(Max.)	-	-	-	-	-	-	-	-	-	-	-	-																															
	Mn(Max.)	0.60	0.60	0.90	1.20	1.30	1.40	1.40	1.40	1.40	1.40	1.45	1.65																															
	P(Max.)	0.030	0.080	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030																														
	S(Max.)	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030																														
	Other	-	-	-	-	-	-	-	-	-	-	-	-																															
Mechanical properties	Tensile strength (Min.)	PSI	45,000	48,000	50,000	50,000	63,000	66,000	71,000	75,000	77,000	82,000	-	60000	75000	95000	10000																											
		MPa	310	331	414	414	434	455	490	517	531	565	-	414	517	655	689																											
		kgf/mm ²	31.6	33.7	42.2	42.2	44.3	46.4	49.9	52.7	54.1	57.7	-	42.2	52.7	66.8	70.3																											
	Yield point (Min.)	PSI	25,000	30,000	35,000	42,000	46,000	52,000	56,000	60,000	65,000	70,000	-	40000-60000	55000-80000	80000-100000																												
		MPa	172	207	241	290	317	359	386	414	448	483	-	276-552	379-552	552-758																												
		kgf/mm ²	17.6	21.6	24.6	29.5	32.3	36.6	39.4	42.2	45.7	49.2	-	28.1-56.2	39.7-56.2	56.2-77.3																												
Elongation (Min.)(%)		U.S. Customary Equation e = 625,000(A ^{0.5} /U ^{0.75}) Metric Equation e = 1.944(A ^{0.5} /U ^{0.75}) e : Minimum elongation in 2 in. (50.80mm) in percent rounded to nearest 1/2 percent A : Cross-sectional area of the tensile test specimen in sq. in. (mm) U : Specified minimum ultimate tensile strength. PSI (MPa)												e : Minimum elongation in 50.80mm in percent rounded to nearest 0.5% A : Cross-sectional area of the tensile test specimen in sq.mm U : Specified tensile strength in N/mm ²																														
Flattening test	H : Distance between Flattening plates(mm) D : Outside diameter of the pipe(mm) T : Wall thickness of the pipe(mm)	Welded part H = 3/4D base metal H = 0.6D		Flattening test Welded part H = 2/3D Base metal H = 1/3D Weld ductility test H = 0.071√D (Grades less than X 52) H = 3.05t (Grades X 52 or higher)										D/t ≥ 16 H=0.5D D/t ≤ 16 H=D(0.83-0.026D/t) D/t ≥ 16H=0.65D 3.93 ≤ D/t ≤ 16 H=D(0.98-0.026D/t) D/t ≤ 3.93 H=D(1.104-0.0518D/t)																														
Bending test	Bending angle X Inside radius (D : Outside diameter of the pipe)	90° X 12D (Nominal size 2 or below)																																										
Hydrostatic test	P : Test pressure, PSI (MPa) S : Fiber stress, PSI(MPa) t : Wall thickness, in. (mm) D : Outside diameter, in.(mm)	U.S. Customary Formula $P = \frac{2St}{D}$ Metric Formula $P = \frac{2000St}{D}$		Grade		Size Designation		Percent of specified minimum yield strength(%)		STD		ALT		P=2st/D <table><tr><th rowspan="2">Grade</th><th colspan="3">F factor</th></tr><tr><th colspan="2">STD</th><th>ALT</th></tr><tr><th></th><th>smaller than 10 3/4</th><th>10 3/4 and larger</th><th>All sizes</th></tr><tr><td>H40</td><td>0.8</td><td>0.6</td><td>0.8</td></tr><tr><td>J55</td><td>0.8</td><td>0.6</td><td>0.8</td></tr><tr><td>K55</td><td>0.8</td><td>0.6</td><td>0.8</td></tr><tr><td>N80</td><td>0.8</td><td>0.8</td><td>-</td></tr></table>				Grade	F factor			STD		ALT		smaller than 10 3/4	10 3/4 and larger	All sizes	H40	0.8	0.6	0.8	J55	0.8	0.6	0.8	K55	0.8	0.6	0.8	N80	0.8	0.8	-
Grade	F factor																																											
	STD		ALT																																									
	smaller than 10 3/4	10 3/4 and larger	All sizes																																									
H40	0.8	0.6	0.8																																									
J55	0.8	0.6	0.8																																									
K55	0.8	0.6	0.8																																									
N80	0.8	0.8	-																																									
NDT (Non-Destructive Test)				Electric resistance welded pipe : Ultrasonic Test or Electromagnetic Test(Eddy Current Test) submerged-arc weld pipe : Radiographic test										Ultrasonic Test or Electromagnetic Test																														
Others		Residual Magnetism Measurement																																										

Screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS21 pipe threads



BS 1387 : 1985														
Classification	Nominal Bore		Outside diameter (black pipes)				Wall thickness		Nominal weight (black pipes)					
			Max.		Min.				Plain end			Screwed & socketed		
	in.	mm	in.	mm	in.	mm	in.	mm	lb/ft	kg/ft	kg/m	lb/ft	kg/ft	kg/m
Light weight pipes (L)	3/8	10	0.673	17.1	0.657	16.7	0.071	1.8	0.450	0.204	0.670	0.454	0.206	0.676
	1/2	15	0.843	21.4	0.827	21.0	0.079	2.0	0.636	0.289	0.947	0.642	0.291	0.956
	3/4	20	1.059	26.9	1.039	26.4	0.091	2.3	0.927	0.421	1.38	0.934	0.424	1.39
	1	25	1.331	33.8	1.307	33.2	0.102	2.6	1.331	0.604	1.98	1.344	0.610	2.00
	1-1/4	32	1.673	42.5	1.650	41.9	0.102	2.6	1.707	0.774	2.54	1.727	0.783	2.57
	1-1/2	40	1.906	48.4	1.882	47.8	0.114	2.9	2.170	0.985	3.23	2.197	0.997	3.27
	2	50	2.370	60.2	2.346	59.6	0.114	2.9	2.742	1.244	4.08	2.789	1.265	4.15
	2-1/2	65	2.992	76.0	2.961	75.2	0.126	3.2	3.837	1.740	5.71	3.918	1.777	5.83
	3	80	3.492	88.7	3.461	87.9	0.126	3.2	4.516	2.048	6.72	4.630	2.100	6.89
	4	100	4.484	113.9	4.449	113.0	0.142	3.6	6.552	2.972	9.75	6.720	3.048	10.0
Medium weight pipes (M)	3/8	10	0.685	17.4	0.661	16.8	0.091	2.3	0.564	0.256	0.839	0.568	0.258	0.845
	1/2	15	0.854	21.7	0.831	21.1	0.102	2.6	0.813	0.369	1.21	0.820	0.372	1.22
	3/4	20	1.071	27.2	1.047	26.6	0.102	2.6	1.048	0.475	1.56	1.055	0.479	1.57
	1	25	1.346	34.2	1.315	33.4	0.126	3.2	1.619	0.735	2.41	1.633	0.741	2.43
	1-1/4	32	1.689	42.9	1.657	42.1	0.126	3.2	2.083	0.945	3.10	2.103	0.954	3.13
	1-1/2	40	1.921	48.8	1.890	48.0	0.126	3.2	2.399	1.088	3.57	2.426	1.100	3.61
	2	50	2.394	60.8	2.354	59.8	0.142	3.6	3.380	1.533	5.03	3.427	1.554	5.10
	2-1/2	65	3.016	76.6	2.969	75.4	0.142	3.6	4.321	1.960	6.43	4.401	1.996	6.55
	3	80	3.524	89.5	3.469	88.1	0.157	4.0	5.624	2.551	8.37	5.739	2.603	8.54
	4	100	4.524	114.9	4.461	113.3	0.177	4.5	8.198	3.719	12.2	8.400	3.810	12.5
	5	125	5.535	140.6	5.461	138.7	0.197	5.0	11.155	5.060	16.6	11.491	5.212	17.1
	6	150	6.539	166.1	6.461	164.1	0.197	5.0	13.238	6.005	19.7	13.641	6.187	20.3
Heavy weight pipes (H)	3/8	10	0.685	17.4	0.661	16.8	0.114	2.9	0.685	0.311	1.02	0.692	0.314	1.03
	1/2	15	0.854	21.7	0.831	21.1	0.126	3.2	0.968	0.439	1.44	0.974	0.442	1.45
	3/4	20	1.071	27.2	1.047	26.6	0.126	3.2	1.257	0.570	1.87	1.263	0.573	1.88
	1	25	1.346	34.2	1.315	33.4	0.157	4.0	1.976	0.896	2.94	1.989	0.902	2.96
	1-1/4	32	1.689	42.9	1.657	42.1	0.157	4.0	2.553	1.158	3.80	2.574	1.167	3.83
	1-1/2	40	1.921	48.8	1.890	48.0	0.157	4.0	2.943	1.335	4.38	2.970	1.347	4.42
	2	50	2.394	60.8	2.354	59.8	0.177	4.5	4.160	1.887	6.19	4.207	1.908	6.26
	2-1/2	65	3.016	76.6	2.969	75.4	0.177	4.5	5.329	2.417	7.93	5.409	2.454	8.05
	3	80	3.524	89.5	3.469	88.1	0.197	5.0	6.920	3.139	10.3	7.056	3.200	10.5
	4	100	4.524	114.9	4.461	113.3	0.213	5.4	9.744	4.420	14.5	9.945	4.511	14.8
	5	125	5.535	140.6	5.461	138.7	0.213	5.4	12.028	5.456	17.9	12.364	5.608	18.4
	6	150	6.539	166.1	6.461	164.1	0.213	5.4	14.312	6.492	21.3	14.716	6.675	21.9



Scope

Carbon steel pipes used for the piping for conveying steam, water (except public water supply service), oil, gas, air, etc. at comparatively low working pressures.

JIS G 3452							
Nominal diameter		Outside diameter mm	Tolerances on outside diameter		Wall thickness mm	Tolerances on wall thickness	Unit mass excluding socket kg/m
A	B		Pipes to be cut in taper thread	Other pipes			
6	1/8	10.5	± 0.5 mm	± 0.5 mm	2.0	+Not specified	0.419
8	1/4	13.8	± 0.5 mm	± 0.5 mm	2.3	-12.5 %	0.652
10	3/8	17.3	± 0.5 mm	± 0.5 mm	2.3		0.851
15	1/2	21.7	± 0.5 mm	± 0.5 mm	2.8		1.31
20	3/4	27.2	± 0.5 mm	± 0.5 mm	2.8		1.68
25	1	34.0	± 0.5 mm	± 0.5 mm	3.2		2.43
32	1-1/4	42.7	± 0.5 mm	± 0.5 mm	3.5		3.38
40	1-1/2	48.6	± 0.5 mm	± 0.5 mm	3.5		3.89
50	2	60.5	± 0.5 mm	± 1 %	3.8		5.31
65	2-1/2	76.3	± 0.7 mm	± 1 %	4.2		7.47
80	3	89.1	± 0.8 mm	± 1 %	4.2		8.79
90	3-1/2	101.6	± 0.8 mm	± 1 %	4.2		10.1
100	4	114.3	± 0.8 mm	± 1 %	4.5		12.2
125	5	139.8	± 0.8 mm	± 1 %	4.5		15.0
150	6	165.2	± 0.8 mm	± 1.6 mm	5.0		19.8
175	7	190.7	± 0.9 mm	± 1.6 mm	5.3		24.2
200	8	216.3	± 1.0 mm	± 0.8 %	5.8		30.1
225	9	241.8	± 1.2 mm	± 0.8 %	6.2		36.0
250	10	267.4	± 1.3 mm	± 0.8 %	6.6		42.4
300	12	318.5	± 1.5 mm	± 0.8 %	6.9		53.0
350	14	355.6	—	± 0.8 %	7.9		67.7
400	16	406.4	—	± 0.8 %	7.9		77.6
450	18	457.2	—	± 0.8 %	7.9		87.5
500	20	508.0	—	± 0.8 %	7.9		97.4

NOTE : The unit mass values have been calculated from the following formula assuming 1 cm³ of steel to be 7.85 g and rounded off to three significant figures in accordance with rule A of JIS Z 8401.

Chemical composition

Unit : %

Symbol of grade	P	S
SGP	0.040 max.	0.040 max.

Tensile strength

Symbol of grade	Tensile strength N/mm ²
SGP	290 min.

Standard for Steel Pipe & Galvanized steel Pipes STADARD TIS 276-2532&277-2532



uon.276-2532 & uon.277-2532

STANDARD	CHEMICAL COMPOSITION				MECHANICAL PROPERTIES			HYDROSTATIC (MPA)
	C MAX%	Mn MAX%	P MAX%	S MAX%	YIELD STRENGTH (MIN)	TENSILE STRENGTH (MIN) : MPA	ELONGATION (MIN) : %	
TYPE 1	-	-	-	-	-	320.0	20.0	5
TYPE 2	-	-	-	-	-	320.0	20.0	5
TYPE 3	-	-	-	-	-	320.0	20.0	5
TYPE 4	-	-	-	-	-	320.0	20.0	5

Nominal SIZE		Outside Diameter		Wall Thickness	Calculated Weight
mm.	in.	Min mm.	Max mm.	mm.	kg/m

TYPE 1 (Us:inn1)

15	1/2"	21.0	21.4	2.00	0.95
20	3/4"	26.4	26.9	2.30	1.38
25	1"	33.2	33.8	2.60	1.98
32	1-1/4"	41.9	42.5	2.60	2.54
40	1-1/2"	47.8	48.4	2.90	3.23
50	2"	59.6	60.2	2.90	4.08
65	2-1/2"	75.2	76.0	3.20	5.71
80	3"	87.9	88.7	3.20	6.72
100	4"	113.0	113.9	3.60	9.75

TYPE 2 (Us:inn2)

15	1/2"	21.0	21.8	2.60	1.21
20	3/4"	26.5	27.3	2.60	1.56
25	1"	33.3	34.2	3.20	2.41
32	1-1/4"	42.0	42.9	3.20	3.10
40	1-1/2"	47.9	48.8	3.20	3.56
50	2"	59.7	60.8	3.60	5.03
65	2-1/2"	75.3	76.6	3.60	6.42
80	3"	88.0	89.5	4.00	8.36
100	4"	113.1	115.0	4.50	12.20
125	5"	138.5	140.8	5.00	16.60
150	6"	163.9	166.5	5.00	19.80

TYPE 3 (Us:inn3)

15	1/2"	21.0	21.8	3.20	1.44
20	3/4"	26.5	27.3	3.20	1.87
25	1"	33.3	34.2	4.00	2.93
32	1-1/4"	42.0	42.9	4.00	3.79
40	1-1/2"	47.9	48.8	4.00	4.37
50	2"	59.7	60.8	4.50	6.19
65	2-1/2"	75.3	76.6	4.50	7.93
80	3"	88.0	89.5	5.00	10.30
100	4"	113.1	115.0	5.40	14.50
125	5"	138.5	140.8	5.40	17.90
150	6"	163.9	166.5	5.40	21.30

TYPE 4 (Us:inn4)

65	2-1/2"	72.3	73.7	5.20	8.60
80	3"	88.0	89.8	5.50	11.30
100	4"	113.2	115.4	6.00	16.10
125	5"	139.9	142.7	6.60	21.80
150	6"	166.6	170.0	7.10	28.30
200(n)	8"	216.9	221.3	7.00	26.80
200(u)	8"	216.9	221.3	8.20	42.50

ASTM : American Society Of Testing And Materials



Standard specification for Pipe,Steel, Black and Hot-Dipped, Zinc-Coated,Welded and Seamless

ASTM A53

NPS Designator	Outside diameter		Wall thickness		Nominal weight						Weight class	Schedule No.	Test pressure							
					Plain end			threads & couplings					Plain end				threads & couplings			
													Grade A		Grade B		Grade A		Grade B	
in.	in.	mm	in.	mm	lb/ft	kg/ft	kg/m	lb/ft	kg/ft	kg/m			psi	kpa	psi	kpa	psi	kpa	psi	kpa
3/8	0.675	17.1	0.091	2.31	0.57	0.26	0.84	0.57	0.26	0.84	STD	40	700	4800	700	4800	700	4800	700	4800
			0.126	3.20	0.74	0.34	1.10	0.74	0.34	1.10	XS	80	850	5900	850	5900	850	5900	850	5900
1/2	0.840	21.3	0.109	2.77	0.85	0.39	1.27	0.85	0.39	1.27	STD	40	700	4800	700	4800	700	4800	700	4800
			0.147	3.73	1.09	0.49	1.62	1.09	0.49	1.62	XS	80	850	5900	850	5900	850	5900	850	5900
			0.188	4.78	1.31	0.59	1.95	-	-	-	-	160	900	6200	900	6200	-	-	-	-
3/4	1.050	26.7	0.113	2.87	1.13	0.52	1.69	1.13	0.52	1.69	STD	40	700	4800	700	4800	700	4800	700	4800
			0.154	3.91	1.48	0.67	2.20	1.48	0.67	2.21	XS	80	850	5900	850	5900	850	5900	850	5900
			0.219	5.56	1.95	0.88	2.90	-	-	-	-	160	950	6500	950	6500	-	-	-	-
1	1.315	33.4	0.133	3.38	1.68	0.76	2.50	1.68	0.76	2.50	STD	40	700	4800	700	4800	700	4800	700	4800
			0.179	4.55	2.17	0.99	3.24	2.18	0.99	3.25	XS	80	850	5900	850	5400	850	5900	850	5900
			0.250	6.35	2.85	1.29	4.24	-	-	-	-	160	950	6500	950	6500	-	-	-	-
1-1/4	1.660	42.2	0.140	3.56	2.27	1.03	3.39	2.28	1.04	3.40	STD	40	1200	8300	1300	9000	1000	6890	1100	7580
			0.191	4.85	3.00	1.36	4.47	3.02	1.37	4.49	XS	80	1800	12400	1900	13100	1500	10340	1600	11030
			0.250	6.35	3.77	1.71	5.61	-	-	-	-	160	1900	13100	2000	13800	-	-	-	-
1-1/2	1.900	48.3	0.145	3.68	2.72	1.23	4.05	2.73	1.24	4.04	STD	40	1200	8300	1300	9000	1000	6890	1100	7580
			0.200	5.08	3.63	1.65	5.41	3.66	1.64	5.39	XS	80	1800	12400	1900	13100	1500	10340	1600	11030
			0.281	7.14	4.86	2.21	7.25	-	-	-	-	160	1950	13400	2050	14100	-	15900	-	-
2	2.375	60.3	0.154	3.91	3.66	1.66	5.44	3.68	1.66	5.46	STD	40	2300	15900	2500	17200	2300	15900	2500	17200
			0.218	5.54	5.03	2.28	7.48	5.07	2.30	7.55	XS	80	2500	17200	2500	17200	2500	17200	2500	17200
			0.344	8.74	7.47	3.39	11.11	-	-	-	-	160	2500	17200	2500	17200	-	-	-	-
2-1/2	2.875	73.0	0.203	8.16	5.80	2.63	8.63	5.82	2.64	8.67	STD	40	2500	17200	2500	17200	2500	17200	2500	17200
			0.276	7.01	7.67	3.48	11.41	7.73	3.51	11.52	XS	80	2500	17200	2500	17200	2500	17200	2500	17200
			0.375	9.52	10.02	4.54	14.90	-	-	-	-	160	2500	17200	2500	17200	-	-	-	-
3	3.500	88.9	0.125	3.18	4.51	2.05	6.72	-	-	-	-	-	1290	8900	1500	10340	-	-	-	-
			0.156	3.96	5.58	2.53	8.29	-	-	-	-	-	1600	11000	1870	12900	-	-	-	-
			0.188	4.78	6.66	3.02	9.92	-	-	-	-	-	1930	13330	2260	15600	-	-	-	-
			0.216	5.49	7.58	3.44	11.29	7.62	3.46	11.35	STD	40	2220	15300	2500	17200	2200	15170	2500	17200
			0.250	6.35	8.69	3.94	12.93	-	-	-	-	-	2500	17200	2500	17200	-	-	-	-
			0.281	7.14	9.67	4.39	14.40	-	-	-	-	-	2500	17200	2500	17200	-	-	-	-
			0.300	7.62	10.26	4.65	15.27	10.33	4.69	15.39	XS	80	2500	17200	2500	17200	2500	17200	2500	17200
			0.438	11.13	14.34	6.51	21.35	-	-	-	-	160	2500	17200	2500	17200	-	-	-	-
3-1/2	4.000	101.6	0.125	3.18	5.18	2.35	7.72	-	-	-	-	-	1120	7720	1310	9030	-	-	-	-
			0.156	3.96	6.41	2.90	9.53	-	-	-	-	-	1400	9650	1640	11310	-	-	-	-
			0.188	4.78	7.66	3.48	11.41	-	-	-	-	-	1690	11650	1970	13580	-	-	-	-
			0.226	5.74	9.12	4.14	13.57	9.20	4.18	13.71	STD	40	2030	14000	2370	16340	2000	13790	2400	16550
			0.250	6.35	10.02	4.55	14.92	-	-	-	-	-	2250	15510	2500	17240	-	-	-	-
			0.281	7.14	11.17	5.07	16.63	-	-	-	-	-	2500	17200	2500	17200	-	-	-	-
4	4.500	114.3	0.125	3.18	5.85	2.65	8.71	-	-	-	-	-	1000	6890	1170	8070	-	-	-	-
			0.156	3.96	7.24	3.29	10.78	-	-	-	-	-	1250	8620	1460	10070	-	-	-	-
			0.188	4.78	8.67	3.93	12.91	-	-	-	-	-	1500	10340	1750	12070	-	-	-	-
			0.219	5.56	10.02	4.54	14.91	-	-	-	-	-	1750	12070	2040	14070	-	-	-	-
			0.237	6.02	10.80	4.90	16.07	10.89	4.95	16.23	STD	40	1900	13100	2210	15240	1900	13100	2200	15170
			0.250	6.35	11.36	5.15	16.90	-	-	-	-	-	2000	13790	2330	16060	-	-	-	-
			0.281	7.14	12.67	5.75	18.87	-	-	-	-	-	2250	15110	2620	18060	-	-	-	-
			0.312	7.92	13.97	6.33	20.78	-	-	-	-	-	2500	17200	2800	19310	-	-	-	-
			0.337	8.56	15.00	6.80	22.32	15.17	6.89	22.60	XS	80	2700	18620	2800	19310	2700	18620	2800	19310
			0.438	11.13	19.02	8.63	28.32	-	-	-	-	120	2800	19310	2800	19310	-	-	-	-
0.531	13.49	22.53	10.22	33.54	-	-	-	-	160	2800	19310	2800	19310	-	-	-	-			

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Standard specification for Pipe,Steel,
Black and Hot-Dipped, Zinc-Coated,Welded and Seamless



ASTM A53

NPS Designator	Outside diameter		Wall thickness		Nominal weight						Weight class	Schedule No.	Test pressure							
					Plain end			threads & couplings					Plain end				threads & couplings			
					in.	in.	mm	in.	mm	lb/ft			kg/ft	kg/m	lb/ft	kg/ft	kg/m	Grade A		Grade B
psi	kpa	psi	kpa	psi							kpa	psi						kpa		
5	5.563	141.3	0.156	3.96	9.02	4.09	13.41	-	-	-	-	-	1010	6960	1180	8140	-	-	-	-
			0.188	4.78	10.79	4.90	16.09	-	-	-	-	-	1220	8410	1420	9790	-	-	-	-
			0.219	5.56	12.50	5.67	18.61	-	-	-	-	-	1420	9790	1650	11380	-	-	-	-
			0.258	6.55	14.62	6.64	21.77	14.81	6.73	22.07	STD	40	1670	11510	1950	13440	1700	11720	1900	13100
			0.281	7.14	15.87	7.20	23.62	-	-	-	-	-	1820	12550	2120	14620	-	-	-	-
			0.312	7.92	17.50	7.94	26.05	-	-	-	-	-	2020	13930	2360	16270	-	-	-	-
			0.344	8.74	19.19	8.71	28.57	-	-	-	-	-	2230	15380	2600	17930	-	-	-	-
			0.375	9.52	20.80	9.43	30.94	21.09	9.58	31.42	XS	80	2430	16750	2800	19310	2400	16550	2800	19310
			0.500	12.70	27.06	12.28	40.28	-	-	-	-	120	2800	19310	2800	19310	-	-	-	-
0.625	15.88	32.99	14.97	49.11	-	-	-	-	160	2800	19310	2800	19310	-	-	-	-			
6	6.625	168.3	0.188	4.78	12.92	5.87	19.27	-	-	-	-	-	1020	7030	1190	8200	-	-	-	-
			0.219	5.56	14.98	6.80	22.31	-	-	-	-	-	1190	8200	1390	9580	-	-	-	-
			0.250	6.35	17.02	7.73	25.36	-	-	-	-	-	1360	9380	1580	10890	-	-	-	-
			0.280	7.11	18.97	8.61	28.26	19.18	8.71	28.58	STD	40	1520	10480	1780	12270	1500	10340	1800	12410
			0.312	7.92	21.04	9.55	31.32	-	-	-	-	-	1700	11720	1980	13650	-	-	-	-
			0.344	8.74	23.08	10.48	34.39	-	-	-	-	-	1870	12890	2180	15030	-	-	-	-
			0.375	9.52	25.03	11.36	37.28	-	-	-	-	-	2040	14070	2380	16410	-	-	-	-
			0.432	10.97	28.57	12.97	42.56	28.89	13.12	43.05	XS	80	2350	16200	2740	18890	2300	15860	2700	18620
			0.562	14.27	36.43	16.52	54.20	-	-	-	-	120	2800	19310	2800	19310	-	-	-	-
0.719	18.26	45.39	20.59	67.56	-	-	-	-	160	2800	19310	2800	19310	-	-	-	-			
8	8.625	219.1	0.188	4.78	16.94	7.70	25.26	-	-	-	-	-	780	5380	920	6340	-	-	-	-
			0.203	5.16	18.26	8.30	27.22	-	-	-	-	-	850	5860	1000	6890	-	-	-	-
			0.219	5.56	19.66	8.92	29.28	-	-	-	-	-	910	6270	1070	7380	-	-	-	-
			0.250	6.35	22.36	10.15	33.31	-	-	-	-	20	1040	7170	1220	8410	-	-	-	-
			0.277	7.04	24.70	11.07	36.31	25.55	11.60	38.07	-	30	1160	7800	1350	9310	1200	8270	1300	8960
			0.312	7.92	27.70	12.57	41.24	-	-	-	-	-	1300	8960	1520	10480	-	-	-	-
			0.322	8.18	28.55	12.97	42.55	29.35	13.33	43.73	STD	40	1340	9240	1570	10820	1300	8960	1600	11030
			0.344	8.74	30.42	13.82	45.34	-	-	-	-	-	1440	9930	1680	11580	-	-	-	-
			0.375	9.52	33.04	15.00	49.20	-	-	-	-	-	1570	10820	1830	12620	-	-	-	-
			0.406	10.31	35.64	16.18	53.08	-	-	-	-	60	1700	11720	2000	13790	-	-	-	-
			0.438	11.13	38.30	17.40	57.08	-	-	-	-	-	1830	12620	2130	14690	-	-	-	-
			0.500	12.70	43.43	19.70	64.64	43.90	19.94	65.41	XS	80	2090	14410	2430	16750	2100	14480	2400	16550
			0.594	15.09	50.95	23.14	75.92	-	-	-	-	100	2500	17240	2800	19310	-	-	-	-
			0.719	18.26	60.77	27.57	90.44	-	-	-	-	120	2800	19310	2800	19310	-	-	-	-
			0.812	20.62	67.76	30.76	100.92	-	-	-	-	140	2800	19310	2800	19310	-	-	-	-
10	10.750	273.0	0.188	4.78	21.21	9.64	31.62	-	-	-	-	-	630	4340	730	5030	-	-	-	-
			0.203	5.16	22.87	10.39	34.08	-	-	-	-	-	680	4690	800	5520	-	-	-	-
			0.219	5.56	24.63	11.18	36.67	-	-	-	-	-	730	5030	860	5930	-	-	-	-
			0.250	6.35	28.04	12.73	41.75	-	-	-	-	20	840	5790	980	6760	-	-	-	-
			0.279	7.09	31.20	14.17	46.49	32.75	14.87	48.80	-	-	930	6410	1090	7520	950	6550	1100	7580
			0.307	7.80	34.24	15.55	51.01	35.75	16.24	53.27	-	30	1030	7100	1200	8270	1000	6890	1200	8270
			0.344	8.74	38.27	17.36	56.96	-	-	-	-	-	1150	9730	1340	9240	-	-	-	-
			0.365	9.27	40.52	18.38	60.29	41.85	19.31	63.36	STD	40	1220	8410	1430	9860	1200	8270	1400	9650
			0.438	11.13	48.28	21.91	71.87	-	-	-	-	-	1470	10140	1710	11790	-	-	-	-
			0.500	12.70	54.79	24.85	81.52	55.82	25.35	83.17	XS	60	1670	11510	1950	13440	1700	11720	2000	13790
			0.594	15.09	64.49	29.25	95.97	-	-	-	-	80	1990	13720	2320	16000	-	-	-	-
			0.719	18.26	77.10	34.96	114.70	-	-	-	-	100	2410	16620	2800	19310	-	-	-	-
			0.844	21.44	89.38	40.54	133.00	-	-	-	-	120	2800	19310	2800	19310	-	-	-	-

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ASTM A53

NPS Designator	Outside diameter		Wall thickness		Nominal weight						Weight class	Schedule No.	Test pressure							
					Plain end			threads & couplings					Plain end				threads & couplings			
					in.	in.	mm	in.	mm	lb/ft			kg/ft	kg/m	lb/ft	kg/ft	kg/m	Grade A		Grade B
psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	psi	kpa	
12	12.750	323.8	0.203	5.16	27.20	12.36	40.55	-	-	-	-	-	570	3930	670	4620	-	-	-	-
			0.219	5.56	29.31	13.30	43.63	-	-	-	-	-	620	4270	720	4960	-	-	-	-
			0.250	6.35	33.38	15.15	49.71	-	-	-	-	20	710	4900	820	5650	-	-	-	-
			0.281	7.14	37.42	16.99	55.75	-	-	-	-	-	790	5450	930	6410	-	-	-	-
			0.312	7.92	41.45	18.80	61.69	-	-	-	-	-	880	6070	1030	7100	-	-	-	-
			0.330	8.38	43.77	19.87	65.18	45.45	20.64	67.72	-	30	930	6410	1090	7520	950	6550	1100	7580
			0.344	8.74	45.62	20.70	67.90	-	-	-	-	-	970	6690	1130	7790	-	-	-	-
			0.375	9.52	49.61	22.49	73.78	51.15	23.23	76.21	STD	-	1060	7310	1240	8550	1100	7580	1200	8270
			0.406	10.31	53.57	24.29	79.70	-	-	-	-	40	1160	7930	1340	9240	-	-	-	-
			0.438	11.13	57.65	26.16	85.82	-	-	-	-	-	1240	8550	1440	9930	-	-	-	-
			0.500	12.70	65.48	29.70	97.43	66.71	30.30	99.40	XS	-	1410	9720	1650	11380	1400	9650	1600	11030
			0.562	14.27	73.22	33.20	108.92	-	-	-	-	60	1590	10960	1850	12760	-	-	-	-
			0.688	17.48	88.71	40.25	132.04	-	-	-	-	80	1940	13380	2270	15650	-	-	-	-
			0.844	21.44	107.42	48.73	159.86	-	-	-	-	100	2390	16480	2780	19170	-	-	-	-
14	14.000	355.6	0.210	5.33	30.93	14.03	46.04				-	-	540	3720	630	4340				
			0.219	5.56	32.23	14.63	47.99				-	-	560	3860	660	4550				
			0.250	6.35	36.71	16.67	54.69				-	10	640	4410	750	5170				
			0.281	7.14	41.17	18.70	61.35				-	-	720	4960	840	5790				
			0.312	7.92	45.61	20.70	67.90				-	20	800	5520	940	6480				
			0.344	8.74	50.17	22.79	74.76				-	-	880	6070	1030	7100				
			0.375	9.52	54.57	24.77	81.25				STD	30	960	6620	1120	7720				
			0.438	11.13	63.44	28.82	94.55				-	40	1130	7790	1110	9030				
			0.469	11.91	67.78	30.77	100.94				-	-	1210	8340	1410	9720				
			0.500	12.07	72.09	32.73	107.39				XS	-	1290	8890	1500	10340				
			0.594	15.09	85.05	38.62	126.71				-	60	1530	10550	1790	12340				
			0.750	19.05	106.13	48.19	158.10				-	80	1930	13310	2250	15510				
			0.938	23.83	130.85	59.42	194.96				-	100	2410	16620	2800	19310				
			1.094	27.79	150.79	68.47	224.65				-	120	2800	19310	2800	19310				
			1.250	31.75	170.22	77.29	253.56				-	140	2800	19310	2800	19310				
			1.406	35.71	189.11	85.86	281.70				-	160	2800	19310	2800	19310				
			2.000	50.80	256.32	116.38	381.83				-	-	2800	19310	2800	19310				
			2.125	53.97	269.51	122.36	401.44				-	-	2800	19310	2800	19310				
			2.200	55.88	277.26	125.89	413.01				-	-	2800	19310	2800	19310				
			2.500	63.50	307.05	139.42	457.40				-	-	2800	19310	2800	19310				
16	16.000	406.4	0.219	5.56	36.91	16.75	54.96				-	-	490	3380	570	3930				
			0.250	6.35	42.05	19.09	62.64				-	10	560	3860	660	4550				
			0.281	7.14	47.22	21.43	70.30				-	-	630	4340	740	5100				
			0.312	7.92	52.32	23.72	77.83				-	20	700	4830	820	5650				
			0.344	8.74	57.57	26.12	85.71				-	-	770	5310	900	6210				
			0.375	9.52	62.64	28.40	93.17				STD	30	840	5790	980	6760				
			0.438	11.13	72.86	33.07	108.49				-	-	990	6830	1150	7930				
			0.469	11.91	77.87	35.31	115.86				-	-	1060	7310	1230	8480				
			0.500	12.70	82.85	37.58	123.30				XS	40	1120	7720	1310	9030				
			0.656	16.66	107.60	48.80	160.12				-	60	1480	10200	1720	11860				
			0.844	21.44	136.74	62.04	203.53				-	80	1900	13100	2220	15310				
			1.031	26.19	164.88	74.85	245.56				-	100	2320	16000	2710	18680				
			1.219	30.96	192.61	87.37	286.64				-	120	2740	18890	2800	19310				
			1.438	36.53	223.85	101.56	333.19				-	140	2800	19310	2800	19310				
			1.594	40.49	245.48	111.36	365.35				-	160	2800	19310	2800	19310				

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ASTM A53

NPS Designator	Outside diameter		Wall thickness		Nominal weight			Weight class	Schedule No.	Test pressure			
					Plain end					Plain end			
	in.	in.	mm	in.	mm	lb/ft	kg/ft			kg/m	Grade A		Grade B
										psi	kpa	psi	kpa
18	18.000	457	0.250	6.35	47.39	21.52	70.60	-	10	500	3450	580	4000
			0.281	7.14	53.18	24.15	79.24	-	-	560	3860	660	4550
			0.312	7.92	58.94	26.75	87.75	-	20	620	4270	730	5030
			0.344	8.74	64.93	29.46	96.66	-	-	690	4760	800	5520
			0.375	9.52	70.65	32.03	105.10	STD	-	750	5170	880	6070
			0.406	10.31	76.36	34.63	113.62	-	-	810	5580	950	6550
			0.438	11.13	82.23	37.32	122.43	-	30	880	6070	1020	7030
			0.469	11.91	87.89	39.86	130.78	-	-	940	6480	1090	7520
			0.500	12.70	93.54	42.43	139.20	XS	-	1000	6890	1170	8070
			0.562	14.27	104.76	47.51	155.87	-	40	1120	7720	1310	9030
			0.750	19.05	138.30	62.74	205.83	-	60	1500	10340	1750	12070
			0.938	23.83	171.08	77.62	254.67	-	80	1880	12960	2190	15100
			1.156	29.36	208.15	94.41	309.76	-	100	2310	15930	2700	18620
			1.375	34.92	244.37	110.84	363.64	-	120	2750	18960	2800	19310
			1.562	39.67	274.48	124.50	408.45	-	140	2800	19310	2800	19310
			1.781	45.24	308.79	140.08	459.59	-	160	2800	19310	2800	19310
20	20.000	508	0.250	6.35	52.73	23.94	78.55	-	10	450	3100	520	3590
			0.281	7.14	59.23	26.88	88.19	-	-	510	3520	590	4070
			0.312	7.92	65.66	29.77	97.67	-	-	560	3860	660	4550
			0.344	8.74	72.28	32.80	107.60	-	-	620	4270	720	4960
			0.375	9.52	78.67	35.67	117.02	STD	20	680	4690	790	5450
			0.406	10.31	84.04	38.57	126.53	-	-	730	5030	850	5860
			0.438	11.13	91.59	41.57	136.37	-	-	790	5450	920	6340
			0.469	11.91	97.92	44.41	145.70	-	-	850	5860	950	6550
			0.500	12.70	104.23	47.28	155.12	XS	30	900	6210	1050	7240
			0.594	15.09	123.23	55.91	183.42	-	40	1170	8070	1250	8620
			0.812	20.62	166.56	75.54	247.83	-	60	1460	10070	1710	11790
			1.031	26.19	209.06	94.84	311.17	-	80	1860	12820	2170	14960
			1.281	32.54	256.34	116.29	381.53	-	100	2310	15930	2690	18550
			1.500	38.10	296.65	134.57	441.49	-	120	2700	18620	2800	19310
			1.750	44.45	341.41	154.87	508.11	-	140	2800	19310	2800	19310
			1.969	50.01	379.53	172.15	564.81	-	160	2800	19310	2800	19310
24	24.000	610	0.250	6.35	63.47	28.79	94.46	-	10	380	2620	440	3030
			0.281	7.14	71.25	32.33	106.08	-	-	420	2900	490	3380
			0.312	7.92	79.01	35.82	117.51	-	-	470	3240	550	3790
			0.344	8.74	86.99	39.47	129.50	-	-	520	3590	600	4140
			0.375	9.52	94.71	42.94	140.88	STD	20	560	3860	660	4550
			0.406	10.31	102.40	46.44	152.37	-	-	610	4210	710	4900
			0.438	11.13	110.32	50.07	164.26	-	-	660	4550	770	5310
			0.469	11.91	117.98	53.50	175.54	-	-	700	4830	820	5650
			0.500	12.70	125.61	56.98	186.94	XS	-	750	5170	880	6070
			0.562	14.27	140.81	63.86	209.50	-	30	840	5790	980	6760
			0.688	17.48	171.45	77.80	255.24	-	40	1030	7100	1200	8270
			0.938	23.83	231.25	104.92	344.23	-	-	1410	9720	1640	11310
			0.969	24.61	238.57	108.21	355.02	-	60	1415	10000	1700	11720
			1.219	30.96	296.86	134.65	441.78	-	80	1830	12620	2130	14690
			1.531	38.69	367.74	166.83	547.33	-	100	2300	15860	2680	18480
			1.812	46.02	429.74	194.94	639.58	-	120	2720	18750	2800	19310
			2.062	52.37	483.57	219.34	719.63	-	140	2800	19310	2800	19310
			2.344	59.54	542.64	246.17	807.63	-	160	2800	19310	2800	19310

PRODUCTS INTRODUCTION

ASTM A106

SEAMLESS CARBON STEEL PIPE FOR HIGH TEMPERATURE SERVICE

Scope

This specification covers seamless carbon steel pipe for high - temperature service in NPS 1/8 to NPS 48 [DN16 - DN1200]

Main Steel Tube Grade :

A106A, A106B, A106C

Other grade can also be provided after consulting with customers.

Chemical Composition & Mechanical Properties

Standard	Grade	Chemical Composition (%)									Mechanical Properties	
		C	Si	Mn	P.S	Cr	Mo	Ni	Cu	V	(MPa) Tensile Strength	(MPa) Yield Strength
ASTM A106	A	≤0.25	≥0.10	0.27-0.93	≤0.035	≤0.40	≤0.15	≤0.40	≤0.40	≤0.08	≥330	≥205
	B	≤0.30	≥0.10	0.29-1.06	≤0.035	≤0.40	≤0.15	≤0.40	≤0.40	≤0.08	≥415	≥240
	C	≤0.35	≥0.10	0.29-1.06	≤0.035	≤0.40	≤0.15	≤0.40	≤0.40	≤0.08	≥485	≥275

General Requirements

1.1 Material furnished to this specification shall conform to the applicable requirements of the current edition of Specification A 530/A 530M unless otherwise provided herein.

Dimensions, Mass, and Permissible Variations

2.1 **Mass** - The mass of any length of pipe shall not vary more than 10% over and 3.5% under that specified. Unless otherwise agreed upon between the manufacturer and the purchaser, pipe in NPS 4 [DN 100] and smaller may be weighed in convenient lots; pipe larger than NPS 4 [DN 100] shall be weighed separately.

2.2 **Diameter** - The tolerances for diameter shall be in accordance with the following:

2.2.1 Except for pipe ordered as special outside diameter tolerance pipe or as inside diameter tolerance pipe, variations in outside diameter shall not exceed those given in Table 3.

2.2.2 For pipe over 10 in. [250 mm] OD ordered as special outside diameter tolerance pipe, the outside diameter shall not vary more than 1% over or 1% under the specified outside diameter.

2.2.3 For pipe over 10 in. [250 mm] ID ordered as inside diameter tolerance pipe, the inside diameter shall not vary more than 1% over or 1% under the specified inside diameter.

2.3 **Thickness** - The minimum wall thickness at any point shall not be more than 12.5% under the specified wall thickness.

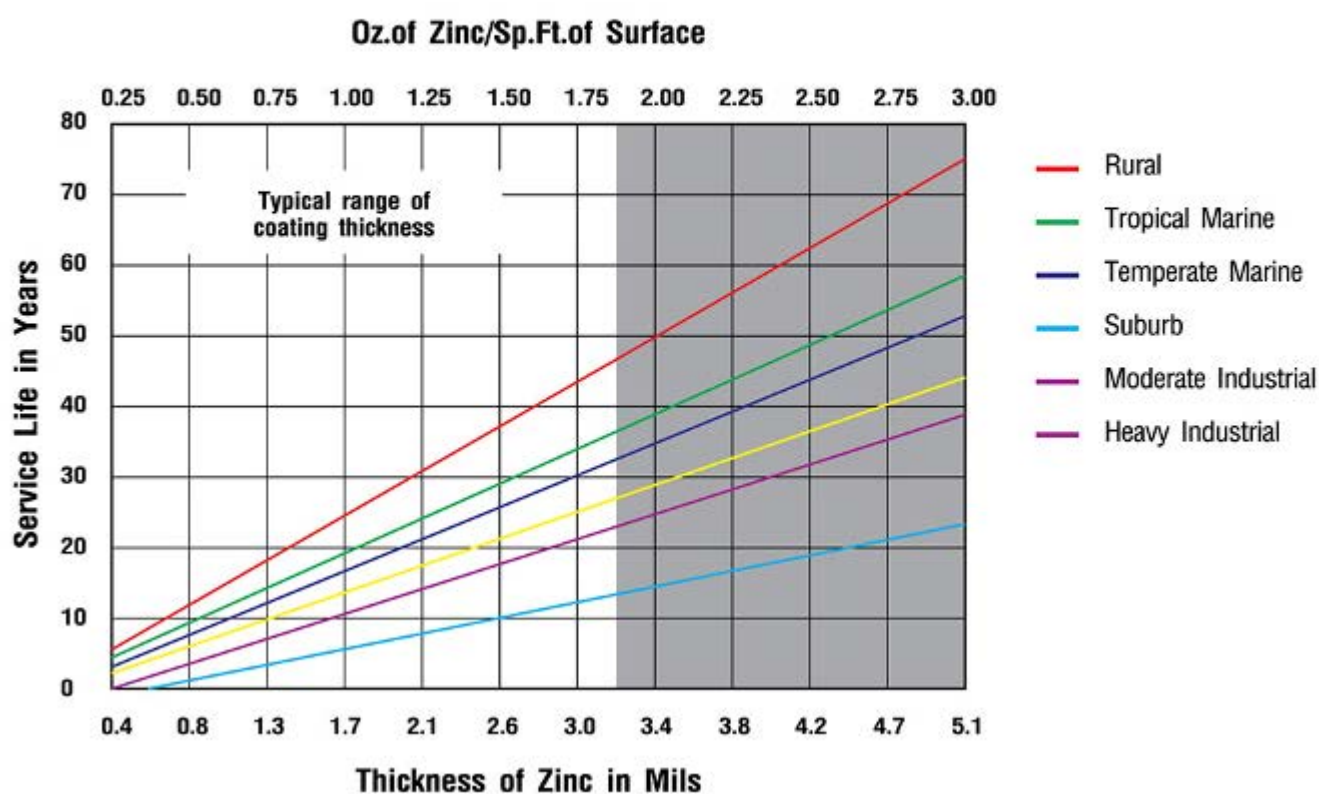
PRODUCTS INTRODUCTION

ASTM A123/123 M

Minimum Average Coating Thickness Grade by Material Category

All Specimens Tested					
Material Category Steel Thickness Range (Measured), in. (mm.)					
	<1/16(<1.6)	1/16to<1/8(1.6to<3.2)	1/8to3/16(3.2to4.8)	>3/16to<1/4(>4.8to6.4)	>1/4(>6.4)
Structural Shapes	45	65	85	85	100
Strip	45	65	75	85	100
Pipe	-	-	75	85	75
Wire	45	45	65	65	85

1g/m² = 0.14 um (305 g/m² = 1 oz/ft² = 43 um = 0.0017 in.)



PRODUCTS INTRODUCTION

API 5L STANDARD

Application : It is used for conveying gas, water, and oil in both the oil and natural gas industries.



Tolerance on Dimension

Standard	Outside Diameter		Wall thickness Tolerance
	Tolerance		Tolerance
API SPEC 5L	D<60.3	+0.41mm, -0.80mm	+15%S, -12.5%S
API SPEC 5L	D≥60.3	+0.75%D, -0.75%D	

Mechanical Properties :

Specification Classification			API 5L (PSL I/PSL II)										
			A25 Class 1Class 2		A	B	X42	X46	X52	X56	X60	X65	X70
Application			Line pipe										
Chemical composition(%)	C(Max.)		0.21 -	0.21 -	0.22 -	0.26 0.22	0.26 0.22	0.26 0.22	0.26 0.22	0.26 0.22	0.26 0.22	0.26 0.22	0.26 0.22
	Si(Max.)		-	-	-	-	-	-	-	-	-	-	-
	Mn(Max.)		0.60 -	0.60 -	0.90 -	1.20 1.20	1.30 1.30	1.40 1.40	1.40 1.40	1.40 1.40	1.45 1.45	1.65 1.65	- 1.85
	P(Max.)		0.030 -	0.080 -	0.030 -	0.030 0.025	0.030 0.025	0.030 0.025	0.030 0.025	0.030 0.025	0.030 0.025	0.030 0.025	- 0.025
	S(Max.)		0.030 -	0.030 -	0.030 -	0.030 0.015	0.030 0.015	0.030 0.015	0.030 0.015	0.030 0.015	0.030 0.015	0.030 0.015	- 0.015
	Other		-	-	-	-	-	-	-	-	-	-	-
Mechanical properties	Tensile strength (Min.)	PSI	45,000 -	48,000 -	60,000 60,000 60,000 110,000	60,000 60,000 63,000 110,000	63,000 66,000 66,000 110,000	66,000 71,000 71,000 110,000	71,000 75,000 75,000 110,000	75,000 77,000 77,000 110,000	77,000 82,000 82,000 110,000	82,000 86,000 86,000 120,000	- 99,000 99,000 120,000
		MPa	310 -	331 -	414 414 414 758	414 414 434 758	434 455 455 758	455 490 490 758	490 517 517 758	517 531 531 758	531 565 565 758	565 621 621 827	
		kgf/mm ²	31.6 -	33.7 -	42.2 42.2 42.2 77.3	42.2 42.2 44.3 77.3	44.3 46.4 46.6 77.3	46.4 49.9 49.9 77.3	49.9 52.7 52.7 77.3	52.7 54.1 54.1 77.3	54.1 57.7 57.7 77.3	57.7 63.3 63.3 84.4	
	Yield point (Min.)	PSI	25,000 -	30,000 -	35,000 35,000 45,000 85,000	42,000 42,000 46,000 72,000	46,000 46,000 52,000 76,000	52,000 56,000 56,000 77,000	56,000 60,000 60,000 79,000	60,000 65,000 65,000 82,000	65,000 70,000 70,000 87,000	70,000 70,000 70,000 90,000	70,000 80,000 80,000 100,000
		MPa	172 -	207 -	241 241 241 448	290 290 290 490	317 317 317 524	359 359 359 531	386 386 386 544	414 414 414 565	448 448 448 600	483 483 483 621	- 552 552 680
		kgf/mm ²	17.6 -	21.6 -	24.6 24.6 24.6 45.7	29.5 29.5 29.5 50.6	32.3 32.3 32.3 54.1	36.6 36.6 36.6 55.4	39.4 39.4 39.4 55.4	42.2 42.2 42.2 57.7	45.7 45.7 45.7 61.2	49.2 49.2 49.2 63.3	- 56.2 56.2 70.2
	Elongation (Min.)(%)		U.S. Customary Equation e = 625.000(A ^{0.02} /U ^{0.9}) Metric Equation e = 1.944(A ^{0.02} /U ^{0.9}) e : Minimum elongation in 2 in. (50.80mm) in percent rounded to nearest 1/2 percent A : Cross-sectional area of the tensile test specimen in sq. in. (mm) U : Specified minimum ultimate tensile strength. PSI (MPa)										

American Petroleum Institute

This specification covers Seamless and Welded steel line pipe.



Nominal Size	Outside Diameter		Wall Thickness		Weight			Minimum Test Pressure (psi)										
								API 5L										
	in	mm	in	mm	lb/ft	kg/m	kg/ft		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
0.84	0.840	21.3	0.109	2.77	0.85	1.270	0.390	Std.	700	700	-	-	-	-	-	-	-	-
			0.147	3.73	1.09	1.620	0.490	Std.	850	850	-	-	-	-	-	-	-	-
			0.294	7.47	1.72	2.550	0.780	Std.	1000	1000	-	-	-	-	-	-	-	-
1.05	1.050	26.7	0.113	2.87	1.13	1.690	0.510	Std.	700	700	-	-	-	-	-	-	-	-
			0.154	3.91	1.48	2.200	0.670	Std.	850	850	-	-	-	-	-	-	-	-
			0.308	7.82	2.44	3.640	1.110	Std.	1000	1000	-	-	-	-	-	-	-	-
1.315	1.315	33.4	0.133	3.38	1.68	2.500	0.760	Std.	700	700	-	-	-	-	-	-	-	-
			0.179	4.55	2.17	3.240	0.990	Std.	850	850	-	-	-	-	-	-	-	-
			0.358	9.09	3.66	5.450	1.660	Std.	1000	1000	-	-	-	-	-	-	-	-
1.66	1.660	42.2	0.140	3.56	2.72	3.390	1.030	Std.	1200	1300	-	-	-	-	-	-	-	-
			0.191	4.85	3.00	4.470	1.360	Std.	1800	1900	-	-	-	-	-	-	-	-
			0.382	9.70	5.22	7.770	2.370	Std.	2200	2300	-	-	-	-	-	-	-	-
1.90	1.900	48.3	0.145	3.68	2.72	4.050	1.230	Std.	1200	1300	-	-	-	-	-	-	-	-
			0.200	5.08	3.63	5.410	1.650	Std.	1800	1900	-	-	-	-	-	-	-	-
			0.400	10.16	6.41	9.560	2.910	Std.	2200	2300	-	-	-	-	-	-	-	-
2-3/8	2.375	60.3	0.083	2.11	2.03	3.030	0.920	Std.	1260	1470	1760	1930	2180	2350	2520	2730	2940	-
								Alt.	1570	1830	2200	2410	2730	2940	3150	3410	3670	-
			0.109	2.77	2.64	3.930	1.200	Std.	1650	1930	2310	2530	2860	3000	3000	3000	3000	-
								Alt.	2070	2410	2890	3170	3580	3860	4130	4470	4820	-
			0.125	3.18	3.01	4.480	1.370	Std.	1890	2210	2650	2910	3000	3000	3000	3000	3000	-
								Alt.	2370	2500	3320	3630	4110	4420	4740	5130	5530	-
			0.141	3.58	3.37	5.010	1.530	Std.	2140	2490	2990	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	3740	4100	4630	4990	5340	5790	6230	-
			0.154	3.91	3.66	5.440	1.660	Std.	2330	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	4090	4470	5060	5450	5840	6320	6810	-
			0.172	4.37	4.05	6.030	1.840	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	4560	5000	5650	6080	6520	7060	7260	-
2-7/8	2.875	73.0	0.188	4.78	4.40	6.540	1.990	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	4990	5460	6170	6650	7120	7260	7260	-
			0.218	5.54	5.03	7.480	2.280	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	5780	6330	7160	7260	7260	7260	7260	-
			0.250	6.35	5.68	8.450	2.570	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	6630	7260	7260	7260	7260	7260	7260	-
			0.281	7.14	6.29	9.360	2.850	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	7260	7260	7260	7260	7260	7260	7260	-
			0.436	11.07	9.04	13.440	4.100	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	7260	7260	7260	7260	7260	7260	7260	-
			0.083	2.11	2.48	3.690	1.120	Std.	1040	1210	1460	1590	1800	1940	2080	2250	2430	-
								Alt.	1300	1520	1820	1990	2250	2430	2600	2810	3030	-
3-1/2	3.00	88.9	0.109	2.77	3.22	4.800	1.460	Std.	1360	1590	1910	2090	2370	2550	2730	2960	3000	-
								Alt.	1710	1990	2390	2620	2960	3180	3410	3700	3980	-
			0.125	3.18	3.67	5.480	1.670	Std.	1570	1830	2190	2400	2710	2920	3000	3000	3000	-
								Alt.	1960	2280	2740	3000	3390	3650	3910	4240	4570	-
			0.141	3.58	4.12	6.130	1.870	Std.	1770	2060	2470	2710	3000	3000	3000	3000	3000	-
								Alt.	2210	2500	3090	3380	3830	4120	4410	4780	5150	-
			0.156	3.96	4.53	6.740	2.050	Std.	1950	2280	2730	3000	3000	3000	3000	3000	3000	-
								Alt.	2440	2500	3420	3740	4230	4560	4880	5290	5700	-
			0.172	4.37	4.97	7.400	2.250	Std.	2150	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	3770	4130	4670	5030	5380	5830	6280	-
			0.188	4.78	5.40	8.04	2.450	Std.	2350	2500	3000	3000	3000	3000	3000	3000	3000	-
								Alt.	2500	2500	4120	4510	5100	5490	5890	6380	6870	-
0.203	5.16	5.80	8.630	2.630	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	4450	4870	5510	5930	6350	6880	7260	-			
0.216	5.49	6.14	9.140	2.790	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	4730	5180	5860	6310	6760	7260	7260	-			
0.250	6.35	7.02	10.440	3.180	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	5480	6000	6780	7260	7260	7260	7260	-			
0.276	7.01	7.67	11.410	3.480	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	6050	6620	7260	7260	7260	7260	7260	-			
0.552	14.02	13.71	20.390	6.220	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	7260	7260	7260	7260	7260	7260	7260	-			
3-1/2	3.00	88.9	0.083	2.11	3.03	4.520	1.380	Std.	850	1000	1200	1310	1480	1590	1710	1850	1990	-
								Alt.	1070	1250	1490	1640	1850	1990	2130	2310	2490	-
			0.109	2.77	3.95	5.880	1.790	Std.	1120	1310	1570	1720	1940	2090	2240	2430	2620	-
								Alt.	1400	1640	1960	2150	2430	2620	2800	3040	3270	-
			0.125	3.18	4.51	6.720	2.050	Std.	1290	1500	1800	1970	2230	2400	2570	2790	3000	-
								Alt.	1610	1880	2250	2460	2790	3000	3210	3480	3750	-
			0.141	3.58	5.06	7.530	2.300	Std.	1450	1690	2030	2220	2510	2710	2900	3000	3000	-
								Alt.	1810	2120	2540	2780	3140	3380	3630	3930	4230	-
			0.156	3.96	5.58	8.290	2.530	Std.	1600	1870	2250	2460	2780	3000	3000	3000	3000	-
								Alt.	2010	2340	2810	3080	3480	3740	4010	4350	4680	-
			0.172	4.37	6.12	9.110	2.780	Std.	1770	2060	2480	2710	3000	3000	3000	3000	3000	-
								Alt.	2210	2500	3100	3390	3830	4130	4420	4790	5160	-
0.188	4.78	6.66	9.920	3.020	Std.	1930	2260	2710	2970	3000	3000	3000	3000	3000	-			
					Alt.	2420	2500	3380	3710	4190	4510	4830	5240	5640	-			
0.216	5.49	7.58	11.290	3.440	Std.	2220	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	3890	4260	4810	5180	5550	6020	6480	-			
0.250	6.35	8.69	12.930	3.940	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	4500	4930	5570	6000	6430	6960	7260	-			
0.281	7.14	9.67	14.400	4.390	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	5060	5540	6260	6740	7230	7260	7260	-			
0.300	7.62	10.26	15.270	4.660	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	5400	5910	6690	7200	7260	7260	7260	-			
0.600	15.24	18.60	27.680	8.440	Std.	2500	2500	3000	3000	3000	3000	3000	3000	3000	-			
					Alt.	2500	2500	7260	7260	7260	7260	7260	7260	7260	-			



This specification covers Seamless and Welded steel line pipe.

Nominal Size	Outside Diameter		Wall Thickness		Weight			Minimum Test Pressure (psi)										
								API 5L										
	in	mm	in	mm	lb/ft	kg/m	kg/ft		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
4	4.000	101.6	0.083	2.11	3.48	5.180	1.580	Std.	750	870	1050	1150	1290	1390	1490	1620	1740	-
								Alt.	930	1090	1310	1430	1620	1740	1870	2020	2180	-
			0.109	2.77	4.53	6.750	2.060	Std.	980	1140	1370	1500	1700	1830	1960	2130	2290	-
								Alt.	1230	1430	1720	1880	2130	2290	2450	2660	2860	-
			0.125	3.18	5.18	7.720	2.350	Std.	1130	1310	1580	1730	1950	2100	2250	2440	2630	-
								Alt.	1410	1640	1970	2160	2440	2630	2810	3050	3280	-
			0.141	3.58	5.82	8.650	2.640	Std.	1270	1480	1780	1950	2200	2370	2540	2750	2960	-
								Alt.	1590	1850	2220	2430	2750	2960	3170	3440	3700	-
			0.156	3.96	6.41	9.530	2.910	Std.	1400	1640	1970	2150	2430	2620	2810	3000	3000	-
								Alt.	1760	2050	2460	2690	3040	3280	3510	3800	4100	-
4-1/2	4.500	114.3	0.083	2.11	3.92	5.840	1.780	Std.	660	770	930	1020	1150	1240	1330	1440	1550	1770
								Alt.	830	970	1160	1270	1440	1550	1660	1800	1940	2210
			0.125	3.18	5.85	8.710	2.660	Std.	1000	1170	1400	1530	1730	1870	2000	2170	2330	2670
								Alt.	1250	1460	1750	1920	2170	2330	2500	2710	2920	3330
			0.141	3.58	6.57	9.770	2.980	Std.	1130	1320	1580	1730	1960	2110	2260	2440	2630	3000
								Alt.	1410	1650	1970	2160	2440	2630	2820	3060	3290	3760
			0.156	3.96	7.24	10.780	3.280	Std.	1250	1460	1750	1910	2160	2330	2500	2700	2910	3000
								Alt.	1560	1820	2180	2390	2700	2910	3120	3380	3640	4160
			0.172	4.37	7.96	11.850	3.610	Std.	1380	1610	1930	2110	2390	2570	2750	2980	3000	3000
								Alt.	1720	2010	2410	2640	2980	3210	3440	3730	4010	4590
5-9/16	5.563	141.3	0.083	2.11	4.86	7.240	2.210	Std.	540	630	750	820	930	1000	1070	1160	1250	1430
								Alt.	670	780	940	1030	1160	1250	1340	1450	1570	1790
			0.125	3.18	7.27	10.830	3.300	Std.	810	940	1130	1240	1400	1510	1620	1750	1890	2160
								Alt.	1010	1180	1420	1550	1750	1890	2020	2190	2360	2700
			0.156	3.96	9.02	13.410	4.090	Std.	1010	1180	1410	1550	1750	1880	2020	2190	2360	2690
								Alt.	1260	1470	1770	1930	2190	2360	2520	2730	2940	3370
			0.188	4.78	10.80	16.090	4.900	Std.	1220	1420	1700	1870	2110	2270	2430	2640	2840	3000
								Alt.	1520	1770	2130	2330	2640	2840	3040	3290	3550	4060
			0.219	5.56	12.51	18.610	5.670	Std.	1420	1650	1980	2170	2460	2650	2830	3000	3000	3000
								Alt.	1770	2070	2480	2720	3070	3310	3540	3840	4130	4720
5-9/16	5.563	141.3	0.258	6.55	14.63	21.770	6.630	Std.	1670	1950	2340	2560	2890	3000	3000	3000	3000	3000
								Alt.	2090	2430	2920	3220	3620	3900	4170	4520	4870	5570
			0.281	7.14	15.87	23.620	7.200	Std.	1820	2120	2550	2790	3000	3000	3000	3000	3000	3000
								Alt.	2270	2650	3180	3490	3940	4240	4550	4920	5300	6060
			0.312	7.92	17.51	26.050	7.940	Std.	2020	2360	2830	3000	3000	3000	3000	3000	3000	3000
								Alt.	2520	2800	3530	3870	4370	4710	5050	5470	5890	6730
			0.344	8.74	19.19	28.570	8.710	Std.	2230	2600	3000	3000	3000	3000	3000	3000	3000	3000
								Alt.	2780	2800	3900	4270	4820	5190	5570	6030	6490	7260
			0.375	9.52	20.80	30.940	9.430	Std.	2430	2800	3000	3000	3000	3000	3000	3000	3000	3000
								Alt.	2800	2800	4250	4650	5260	5660	6070	6570	7080	7260
5-9/16	5.563	141.3	0.500	12.70	27.06	40.280	12.280	Std.	2800	2800	3000	3000	3000	3000	3000	3000	3000	3000
								Alt.	2800	2800	5660	6200	7010	7260	7260	7260	7260	7260
5-9/16	5.563	141.3	0.625	15.88	32.99	49.110	14.970	Std.	2800	2800	3000	3000	3000	3000	3000	3000	3000	3000
								Alt.	2800	2800	7080	7260	7260	7260	7260	7260	7260	7260

Please check with the manufacturer the availability of the product

American Petroleum Institute

This specification covers Seamless and Welded steel line pipe.



Nominal Size	Outside Diameter		Wall Thickness		Weight			Minimum Test Pressure (psi)										
								API 5L										
	in	mm	in	mm	lb/ft	kg/m	kg/ft		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
6-5/8	6.625	168.3	0.125	3.18	8.69	12.950	3.950	Std. Alt.	680 850	790 990	1190 1300	1300 1470	1470 1580	1580 1700	1700 1840	1840 1980	1980 2260	2260
			0.141	3.58	9.77	14.540	4.430	Std. Alt.	770 960	890 1120	1340 1470	1470 1660	1660 1790	1790 1920	1920 2080	2080 2230	2230 2550	2550
			0.156	3.96	10.79	16.050	4.890	Std. Alt.	850 1060	990 1240	1480 1620	1620 1840	1840 1980	1980 2120	2120 2300	2300 2470	2470 2830	2830
			0.172	4.37	11.87	17.670	5.380	Std. Alt.	930 1170	1090 1360	1640 1790	1790 2030	2030 2180	2180 2340	2340 2530	2530 2730	2730 3000	3000
			0.188	4.78	12.94	19.270	5.870	Std. Alt.	1020 1280	1190 1490	1790 1960	1960 2210	2210 2380	2380 2550	2550 2770	2770 2980	2980 3410	3410
			0.203	5.16	13.94	20.760	6.330	Std. Alt.	1100 1380	1290 1610	1930 2110	2110 2390	2390 2570	2570 2760	2760 2990	2990 3220	3220 3680	3680
			0.219	5.56	15.00	22.310	6.800	Std. Alt.	1190 1490	1390 1740	2080 2080	2280 2280	2580 2580	2780 2780	2980 2980	3000 3220	3000 3470	3000 3970
			0.250	6.35	17.04	25.360	7.730	Std. Alt.	1360 1700	1580 1980	2380 2380	2600 2940	2940 3170	3000 3400	3000 3680	3000 3960	3000 4530	4530
			0.280	7.11	18.99	28.260	8.610	Std. Alt.	1520 1900	1780 2220	2660 2660	2920 3300	3000 3550	3000 3800	3000 4120	3000 4440	3000 5070	5070
			0.312	7.92	21.06	31.320	9.550	Std. Alt.	1700 2120	1980 2470	2970 2970	3000 3250	3000 3670	3000 3960	3000 4240	3000 4590	3000 4940	3000 5650
			0.344	8.74	23.10	34.390	10.480	Std. Alt.	1870 2340	2180 2730	3000 3270	3000 3580	3000 4050	3000 4360	3000 4670	3000 5060	3000 5450	3000 6230
			0.375	9.52	25.05	37.280	11.360	Std. Alt.	2040 2550	2380 2800	3000 3570	3000 3910	3000 4420	3000 4750	3000 5090	3000 5520	3000 5940	3000 6790
			0.432	10.97	28.60	42.560	12.970	Std. Alt.	2350 2800	2740 2800	3000 4110	3000 4500	3000 5090	3000 5480	3000 5870	3000 6360	3000 6850	3000 7260
			0.500	12.70	32.74	48.730	14.850	Std. Alt.	2720 2800	2800 2800	3000 4750	3000 5210	3000 5890	3000 6340	3000 6790	3000 7260	3000 7260	3000 7260
			0.562	14.27	36.43	54.200	16.520	Std. Alt.	2800 2800	2800 2800	3000 5340	3000 5850	3000 6620	3000 7130	3000 7260	3000 7260	3000 7260	3000 7260
			0.625	15.88	40.09	59.690	18.190	Std. Alt.	2800 2800	2800 2800	3000 5940	3000 6510	3000 7260	3000 7260	3000 7260	3000 7260	3000 7260	3000 7260
			0.719	18.26	45.39	67.560	20.590	Std. Alt.	2800 2800	2800 2800	3000 6840	3000 7260	3000 7260	3000 7260	3000 7260	3000 7260	3000 7260	3000 7260
8-5/8	8.625	219.1	0.125	3.18	11.36	16.930	5.160	Std. Alt.	520 650	610 760	910 910	1000 1130	1130 1220	1220 1300	1300 1410	1410 1520	1520 1740	1740
			0.156	3.96	14.12	21.010	6.400	Std. Alt.	650 810	760 950	1140 1140	1250 1250	1410 1410	1520 1520	1630 1630	1760 1760	1900 1900	2170 2170
			0.188	4.78	16.96	25.260	7.700	Std. Alt.	780 980	920 1140	1370 1370	1500 1500	1700 1700	1830 1830	1960 1960	2130 2130	2290 2290	2620 2620
			0.203	5.16	18.28	27.220	8.300	Std. Alt.	850 1060	990 1240	1480 1480	1620 1620	1840 1840	1980 1980	2120 2120	2290 2290	2470 2470	2820 2820
			0.219	5.56	19.68	29.280	8.920	Std. Alt.	910 1140	1070 1330	1600 1600	1750 1750	1980 1980	2130 2130	2290 2290	2480 2480	2670 2670	3000 3050
			0.250	6.35	22.38	33.310	10.150	Std. Alt.	1040 1300	1220 1520	1830 1830	2000 2000	2260 2260	2430 2430	2610 2610	2830 2830	3000 3040	3000 3480
			0.277	7.04	24.72	36.810	11.220	Std. Alt.	1160 1450	1350 1690	2020 2020	2220 2220	2510 2510	2700 2700	2890 2890	3000 3130	3000 3370	3000 3850
			0.312	7.92	27.73	41.240	12.570	Std. Alt.	1300 1630	1520 1900	2280 2280	2500 2500	2820 2820	3000 3040	3000 3260	3000 3530	3000 3800	3000 4340
			0.322	8.18	28.58	42.550	12.970	Std. Alt.	1340 1680	1570 1960	2350 2350	2580 2580	2910 2910	3000 3140	3000 3360	3000 3640	3000 3920	3000 4480
			0.344	8.74	30.45	45.340	13.820	Std. Alt.	1440 1790	1680 2090	2510 2510	2750 2750	3000 3110	3000 3350	3000 3590	3000 3890	3000 4190	3000 4790
			0.375	9.52	33.07	49.200	12.000	Std. Alt.	1570 1960	1830 2280	2740 2740	3000 3000	3000 3390	3000 3650	3000 3910	3000 4240	3000 4570	3000 5220
			0.438	11.13	38.33	57.080	17.400	Std. Alt.	1830 2290	2130 2670	3000 3200	3000 3500	3000 3960	3000 4270	3000 4570	3000 4950	3000 5330	3000 6090
			0.500	12.70	43.43	64.640	19.700	Std. Alt.	2090 2610	2430 2800	3000 3650	3000 4000	3000 4520	3000 4870	3000 5220	3000 5650	3000 6090	3000 6960
			0.562	14.27	48.44	72.080	21.970	Std. Alt.	2350 2800	2740 2800	3000 4110	3000 4500	3000 5080	3000 5470	3000 5860	3000 6350	3000 6840	3000 7260
			0.625	15.88	53.45	79.580	24.260	Std. Alt.	2610 2800	2800 2800	3000 4570	3000 5000	3000 5650	3000 6090	3000 6520	3000 7070	3000 7260	3000 7260
			0.719	18.26	60.77	90.440	27.570	Std. Alt.	2800 2800	2800 2800	3000 5250	3000 5750	3000 7000	3000 7000	3000 7260	3000 7260	3000 7260	3000 7260

Please check with the manufacturer the availability of the product



This specification covers Seamless and Welded steel line pipe.

Nominal Size	Outside Diameter		Wall Thickness		Weight			Minimum Test Pressure (psi)										
								API 5L										
	in	mm	in	mm	lb/ft	kg/m	kg/ft		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80
10-3/4	10.750	273	0.156	3.96	17.67	26.270	8.010	Std.	520	610	1040	1130	1280	1380	1480	1600	1730	1970
								Alt.	650	760	1040	1130	1280	1380	1480	1600	1730	1970
			0.188	4.78	21.23	31.620	9.640	Std.	630	730	1250	1370	1550	1660	1780	1930	2080	2380
								Alt.	790	920	1250	1370	1550	1660	1780	1930	2080	2380
			0.203	5.16	22.89	34.080	10.390	Std.	680	790	1350	1480	1670	1800	1930	2090	2250	2570
								Alt.	850	990	1350	1480	1670	1800	1930	2090	2250	2570
			0.219	5.56	24.65	36.670	11.180	Std.	730	860	1450	1590	1800	1940	2080	2250	2420	2770
								Alt.	920	1070	1450	1590	1800	1940	2080	2250	2420	2770
			0.250	6.35	28.06	41.750	12.730	Std.	840	980	1660	1820	2060	2210	2370	2570	2770	3000
								Alt.	1050	1220	1660	1820	2060	2210	2370	2570	2770	3160
			0.279	7.09	31.23	46.490	14.170	Std.	930	1090	1850	2030	2290	2470	2650	2870	3000	3000
								Alt.	1170	1360	1850	2030	2290	2470	2650	2870	3090	3530
			0.307	7.80	34.27	51.010	15.550	Std.	1030	1200	2040	2230	2520	2720	2910	3000	3000	3000
								Alt.	1290	1500	2040	2230	2520	2720	2910	3160	3400	3880
			0.344	8.74	38.27	56.960	17.360	Std.	1150	1340	2280	2500	2830	3000	3000	3000	3000	3000
								Alt.	1440	1680	2280	2500	2830	3050	3260	3540	3810	4350
			0.365	9.27	40.52	60.290	18.380	Std.	1220	1430	2420	2660	3000	3000	3000	3000	3000	3000
								Alt.	1530	1780	2420	2660	3000	3230	3460	3750	4040	4620
12-3/4	12.750	323.8	0.172	4.37	23.13	34.420	10.490	Std.	490	570	960	1050	1190	1280	1380	1490	1610	1830
								Alt.	610	710	960	1050	1190	1280	1380	1490	1610	1830
			0.188	4.78	25.25	37.600	11.460	Std.	530	620	1050	1150	1300	1400	1500	1630	1750	2010
								Alt.	660	770	1050	1150	1300	1400	1500	1630	1750	2010
			0.203	5.16	27.23	40.550	12.360	Std.	570	670	1140	1250	1410	1520	1620	1760	1890	2170
								Alt.	720	840	1140	1250	1410	1520	1620	1760	1890	2170
			0.219	5.56	29.34	43.630	13.300	Std.	620	720	1230	1340	1520	1640	1750	1900	2040	2340
								Alt.	770	900	1230	1340	1520	1640	1750	1900	2040	2340
			0.250	6.35	33.41	49.710	15.150	Std.	710	820	1400	1530	1730	1870	2000	2170	2330	2670
								Alt.	880	1030	1400	1530	1730	1870	2000	2170	2330	2670
			0.281	7.14	37.46	55.760	16.990	Std.	790	930	1570	1720	1950	2100	2250	2440	2620	3000
								Alt.	990	1160	1570	1720	1950	2100	2250	2440	2620	3000
			0.312	7.92	41.48	61.690	18.800	Std.	880	1030	1750	1910	2160	2330	2500	2700	2910	3000
								Alt.	1100	1280	1750	1910	2160	2330	2500	2700	2910	3330
			0.330	8.38	43.81	65.180	19.870	Std.	930	1090	1850	2020	2290	2460	2640	2860	3000	3000
								Alt.	1160	1360	1850	2020	2290	2460	2640	2860	3080	3520
			0.344	8.74	45.62	67.900	20.700	Std.	970	1130	1930	2110	2390	2570	2750	2980	3000	3000
								Alt.	1210	1420	1930	2110	2390	2570	2750	2980	3210	3670
14	14.000	355.6	0.188	4.78	27.76	41.350	12.600	Std.	520	610	1040	1130	1280	1380	1480	1600	1730	1970
								Alt.	650	760	1040	1130	1280	1380	1480	1600	1730	1970
			0.203	5.16	29.94	44.590	13.590	Std.	540	630	1070	1170	1330	1430	1530	1660	1790	2040
								Alt.	680	790	1070	1170	1330	1430	1530	1660	1790	2040
			0.210	5.33	30.96	46.040	14.030	Std.	560	660	1120	1220	1380	1490	1600	1730	1860	2130
								Alt.	700	820	1120	1220	1380	1490	1600	1730	1860	2130
			0.219	5.56	32.26	47.990	14.630	Std.	640	750	1280	1400	1580	1700	1820	1970	2130	2430
								Alt.	800	940	1280	1400	1580	1700	1820	1970	2130	2430
			0.250	6.35	36.75	54.690	16.670	Std.	720	840	1430	1570	1770	1910	2050	2220	2390	2730
								Alt.	900	1050	1430	1570	1770	1910	2050	2220	2390	2730
			0.281	7.14	41.21	61.350	18.700	Std.	800	940	1590	1740	1970	2120	2270	2460	2650	3000
								Alt.	1000	1170	1590	1740	1970	2120	2270	2460	2650	3030
			0.312	7.92	45.65	67.900	20.700	Std.	880	1030	1750	1920	2170	2340	2510	2720	2920	3000
								Alt.	1110	1290	1750	1920	2170	2340	2510	2720	2920	3340

Please check with the manufacturer the availability of the product

American Petroleum Institute

This specification covers Seamless and Welded steel line pipe.



Nominal Size	Outside Diameter		Wall Thickness		Weight			Minimum Test Pressure (psi)													
								API 5L													
	in	mm	in	mm	lb/ft	kg/m	kg/ft		Grade A	Grade B	Grade X42	Grade X46	Grade X52	Grade X56	Grade X60	Grade X65	Grade X70	Grade X80			
14	14.000	355.6	0.375	9.52	54.62	81.250	24.760	Std. Alt.	960 1210	1130 1410	1910 1910	2090 2090	2370 2370	2550 2550	2730 2730	2960 2960	3000 3190	3000 3640			
			0.406	10.31	59.00	87.790	26.760	Std. Alt.	1040 1310	1220 1520	2070 2070	2270 2270	2560 2560	2760 2760	2960 3200	3000 3450	3000 3940				
			0.438	11.13	63.50	94.550	28.820	Std. Alt.	1130 1410	1310 1640	2230 2230	2450 2450	2770 2770	2980 2980	3000 3190	3000 3460	3000 3720	3000 4250			
			0.469	11.91	67.84	100.940	30.770	Std. Alt.	1210 1510	1410 1760	2390 2390	2620 2620	2960 2960	3000 3190	3000 3420	3000 3700	3000 3990	3000 4560			
			0.500	12.70	72.16	107.390	32.730	Std. Alt.	1290 1610	1500 1880	2550 2550	2790 2790	3000 3160	3000 3400	3000 3640	3000 3950	3000 4250	3000 4860			
			0.562	14.27	80.73	120.110	36.610	Std. Alt.	1450 1810	1690 2110	2870 2870	3000 3140	3000 3550	3000 3820	3000 4090	3000 4440	3000 4780	3000 5460			
			0.594	15.09	89.36	126.710	38.620	Std. Alt.	1610 2010	1880 2340	3000 3190	3000 3480	3000 3950	3000 4250	3000 4550	3000 4930	3000 5310	3000 6070			
			0.625	15.88	89.36	133.030	40.550	Std. Alt.	1610 2010	1880 2340	3000 3190	3000 3490	3000 3950	3000 4250	3000 4550	3000 4930	3000 5310	3000 6070			
			0.688	17.48	97.91	145.750	44.420	Std. Alt.	1770 2210	2060 2580	3000 3510	3000 3840	3000 4340	3000 4680	3000 5010	3000 5430	3000 5850	3000 6680			
			16	16.000	406.4	0.188	4.78	31.78	47.340	14.430	Std. Alt.	420 530	490 620	840 840	920 920	1040 1040	1120 1120	1200 1200	1300 1300	1400 1400	1600 1600
0.203	5.16	34.28				51.060	15.560	Std. Alt.	460 570	530 670	910 910	990 990	1120 1120	1210 1210	1290 1290	1400 1400	1510 1510	1730 1730			
0.219	5.56	36.95				54.960	16.750	Std. Alt.	490 620	570 720	980 980	1070 1070	1210 1210	1300 1300	1400 1400	1510 1510	1630 1630	1860 1860			
0.250	6.35	42.09				65.640	19.090	Std. Alt.	560 700	660 820	1120 1120	1220 1220	1380 1380	1490 1490	1590 1590	1730 1730	1860 1860	2130 2130			
0.281	7.14	47.22				70.300	21.430	Std. Alt.	630 790	740 920	1250 1250	1370 1370	1550 1550	1670 1670	1790 1790	1940 1940	2090 2090	2390 2390			
0.312	7.92	52.32				77.830	23.720	Std. Alt.	700 880	820 1020	1390 1390	1520 1520	1720 1720	1860 1860	1990 1990	2150 2150	2320 2320	2650 2650			
0.344	8.74	57.57				85.710	26.120	Std. Alt.	770 970	900 1130	1540 1540	1680 1680	1900 1900	2050 2050	2190 2190	2380 2380	2560 2560	2920 2920			
0.375	9.52	62.64				93.170	28.400	Std. Alt.	840 1050	980 1230	1670 1670	1830 1830	2070 2070	2230 2230	2390 2390	2590 2590	2790 2790	3000 3190			
0.406	10.31	67.68				100.700	30.690	Std. Alt.	910 1140	1070 1330	1810 1810	1980 1980	2240 2240	2420 2420	2590 2590	2800 2800	3000 3020	3000 3450			
0.438	11.13	72.86				108.490	33.070	Std. Alt.	900 1230	1150 1440	1950 1950	2140 2140	2420 2420	2610 2610	2790 2790	3000 3020	3000 3260	3000 3630			
0.469	11.91	77.87				115.860	35.310	Std. Alt.	1060 1320	1230 1540	2090 2090	2290 2290	2590 2590	2790 2790	2990 2990	3000 3240	3000 3490	3000 3630			
0.500	12.70	82.85				123.300	37.580	Std. Alt.	1130 1410	1310 1640	2230 2230	2440 2440	2760 2760	2980 2980	3000 3190	3000 3450	3000 3630	3000 3630			
0.562	14.27	92.75				137.990	42.060	Std. Alt.	1260 1580	1480 1840	2510 2510	2750 2750	3000 3110	3000 3340	3000 3580	3000 3630	3000 3630	3000 3630			
0.625	15.88	102.73				152.930	46.610	Std. Alt.	1410 1760	1640 2050	2790 2790	3000 3050	3000 3450	3000 3630	3000 3630	3000 3630	3000 3630	3000 3630			
0.688	17.48	112.62				167.650	51.100	Std. Alt.	1550 1940	1810 2260	3000 3070	3000 3360	3000 3630	3000 3630	3000 3630	3000 3630	3000 3630	3000 3630			
18	18.000	457.2				0.188	4.78	35.80	53.330	16.250	Std. Alt.	380 470	440 550	750 750	820 820	920 920	990 990	1070 1070	1150 1150	1240 1240	1420 1420
						0.219	5.56	41.63	61.920	18.870	Std. Alt.	440 550	510 640	870 870	950 950	1080 1080	1160 1160	1240 1240	1340 1340	1450 1450	1650 1650
						0.250	6.35	47.44	70.600	21.520	Std. Alt.	500 630	580 730	990 990	1090 1090	1230 1230	1320 1320	1420 1420	1530 1530	1650 1650	1890 1890
			0.281	7.14	53.23	79.240	24.150	Std. Alt.	560 700	660 820	1110 1110	1220 1220	1380 1380	1490 1490	1590 1590	1730 1730	1860 1860	2120 2120			
			0.312	7.92	58.99	87.750	26.750	Std. Alt.	620 780	730 910	1240 1240	1360 1360	1530 1530	1650 1650	1770 1770	1920 1920	2060 2060	2360 2360			
			0.344	8.74	64.93	96.660	29.460	Std. Alt.	690 860	800 1000	1360 1360	1490 1490	1690 1690	1820 1820	1950 1950	2110 2110	2270 2270	2600 2600			
			0.375	9.52	70.65	105.100	32.030	Std. Alt.	750 940	880 1090	1490 1490	1630 1630	1840 1840	1980 1980	2130 2130	2300 2300	2480 2480	2830 2830			
			0.406	10.31	76.36	113.620	34.630	Std. Alt.	810 1020	950 1180	1610 1610	1760 1760	1990 1990	2150 2150	2300 2300	2490 2490	2680 2680	3000 3070			
			0.438	11.13	82.23	122.430	37.320	Std. Alt.	880 1100	1020 1280	1740 1740	1900 1900	2150 2150	2320 2320	2480 2480	2690 2690	2900 2900	3000 3310			
			0.469	11.91	87.89	130.780	39.860	Std. Alt.	940 1170	1090 1370	1860 1860	2040 2040	2300 2300	2480 2480	2660 2660	2880 2880	3000 3100	3000 3540			
			0.500	12.70	93.54	139.210	42.430	Std. Alt.	1000 1250	1170 1460	1980 1980	2170 2170	2460 2460	2640 2640	2830 2830	3000 3070	3000 3310	3000 3630			
			0.562	14.27	104.76	155.870	47.510	Std. Alt.	1120 1410	1310 1640	2230 2230	2440 2440	2760 2760	2970 2970	3000 3180	3000 3450	3000 3630	3000 3630			
			0.625	15.88	116.09	172.820	52.680	Std. Alt.	1250 1560	1460 1820	2480 2480	2720 2720	3000 3070	3000 3310	3000 3540	3000 3630	3000 3630	3000 3630			
			0.688	17.48	127.32	189.540	57.770	Std. Alt.	1380 1720	1610 2010	2730 2730	2980 2980	3000 3380	3000 3630	3000 3630	3000 3630	3000 3630	3000 3630			



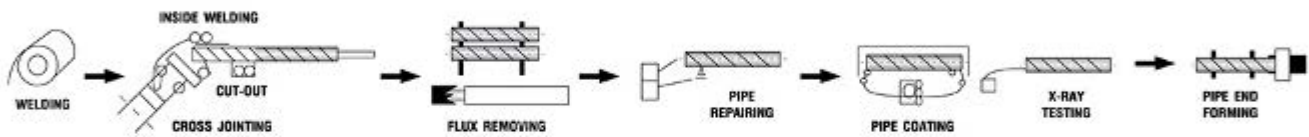
(American Petroleum Institute) Specification for Line Pipes.

Nominal pipe Size		OD.	wall thicknesses = mm unit weight = kg/m													Figures based on stainless steel			
mm	Inch		10	20	30	std	40	60	xs	80	100	120	140	160	xxs	5s	10s	40s	80s
6.0	1/8	10.3				1.730 0.370	1.730 0.370		2.410 0.470	2.410 0.470							1.240 0.280	1.730 0.360	2.410 0.480
8.0	1/4	13.7				2.240 0.630	2.240 0.630		3.020 0.800	3.020 0.800							1.650 0.510	2.240 0.640	3.020 0.820
10.0	3/8	17.1				2.310 0.840	2.310 0.840		3.200 1.100	3.200 1.100							1.650 0.640	2.310 0.860	3.200 1.120
15.0	1/2	21.3				2.770 1.270	2.770 1.270		3.730 1.620	3.730 1.620				4.780 1.950	7.470 2.550	1.650 0.820	2.110 1.010	2.770 1.300	3.730 1.650
20.0	3/4	26.7				2.870 1.960	2.870 1.690		3.910 2.200	3.910 2.200				5.560 2.900	7.820 3.640	1.650 1.040	2.110 1.310	2.870 1.710	3.910 2.240
25.0	1	33.4				3.380 2.500	3.380 2.500		4.550 3.240	4.550 3.240				6.350 4.240	9.090 5.450	1.650 1.330	2.770 2.130	3.380 2.550	4.550 3.290
32.0	1-1/4	42.2				3.560 3.390	3.560 3.390		4.850 4.470	4.850 4.470				6.350 5.610	9.700 7.770	1.650 1.680	2.770 2.760	3.560 3.460	4.850 4.560
40.0	1-1/2	48.3				3.680 4.050	3.680 4.050		5.080 5.410	5.080 5.410				7.140 7.250	10.150 9.560	1.650 1.950	2.770 3.170	3.680 4.130	5.080 5.510
50.0	2	60.3				3.910 5.440	3.910 5.440		5.540 7.480	5.540 7.480				8.740 11.110	11.070 13.440	1.650 2.440	2.770 4.010	3.910 5.540	5.540 7.630
65.0	2-1/2	73.0				5.160 8.630	5.160 8.630		7.010 11.410	7.010 11.410				9.530 14.920	14.020 20.390	2.110 3.770	3.050 5.360	5.160 8.810	7.010 11.640
80.0	3	88.9				5.490 11.290	5.490 11.290		7.620 15.270	7.620 15.270				11.130 21.350	15.240 27.680	2.110 4.600	3.050 6.590	5.490 11.520	7.620 15.590
90.0	3-1/2	101.6				5.740 13.570	5.740 13.570		8.080 18.630	8.080 18.630						2.110 5.290	3.050 7.550	5.740 13.840	8.080 19.010
100.0	4	114.3				6.020 16.070	6.020 16.070		8.560 22.320	8.560 22.320		11.130 28.320		13.490 33.540	17.120 41.030	2.110 5.960	3.050 8.520	6.020 16.400	8.560 22.770
125.0	5	141.3				6.550 21.770	6.550 21.770		9.530 30.970	9.530 30.970		12.700 40.280		15.880 49.110	19.050 57.430	2.770 9.670	3.400 11.820	6.550 22.200	9.530 31.590
150.0	6	168.3				7.110 28.260	7.110 28.260		10.970 42.560	10.970 42.560		14.270 54.200		18.260 67.560	21.950 79.220	2.770 11.550	3.400 14.130	7.110 28.830	10.970 43.420
200.0	8	219.1		6.350 33.310	7.040 36.810	8.180 42.550	8.180 42.550	10.310 53.080	12.700 64.640	12.700 64.640	15.090 75.920	18.260 90.440	20.620 100.920	23.010 111.270	22.230 107.920	2.770 15.090	3.760 20.370	8.180 43.390	12.700 65.950
250.0	10	273.1		6.350 41.770	7.800 51.030	9.270 60.310	9.270 60.310	12.700 81.550	15.090 81.550	15.090 96.010	18.260 114.750	21.440 133.060	25.400 155.150	28.580 172.330	25.400 155.150	3.400 23.080	4.190 28.340	9.270 61.520	12.700 83.190
300.0	12	323.9		6.350 49.730	8.380 65.200	9.530 73.880	9.530 73.880	12.700 108.960	15.090 97.460	15.090 132.080	18.260 159.910	21.440 186.970	25.400 208.140	28.580 238.760	25.400 186.970	3.960 31.890	4.780 36.730	12.700 75.520	15.090 99.430
350.0	14	355.6		6.350 54.690	7.930 67.900	9.530 81.330	9.530 81.330	12.700 94.550	15.090 126.710	15.090 158.100	18.260 194.960	21.440 224.650	25.400 253.560	28.580 281.700	25.400 281.700	4.190 35.060	4.780 42.140		
400.0	16	406.4		6.350 62.640	7.920 77.830	9.530 93.270	9.530 93.270	12.700 123.300	15.090 160.120	15.090 203.530	18.260 245.560	21.440 286.640	25.400 333.190	28.580 365.350	25.400 365.350	4.190 42.410	4.780 48.260		
450.0	18	457.0		6.350 70.570	7.920 87.710	9.530 122.380	9.530 105.160	12.700 155.800	15.090 205.740	15.090 238.800	18.260 309.620	21.440 363.560	25.400 408.260	28.580 459.370	25.400 459.370	4.190 47.770	4.780 54.360		
500.0	20	508.0		6.350 78.550	9.530 117.150	12.700 155.120	9.530 117.150	15.090 183.420	20.620 247.830	20.620 311.170	25.400 381.530	30.960 441.490	38.100 508.110	44.450 564.810	44.450 564.810	4.780 60.460	5.540 70.000		
550.0	22	559.0		6.350 86.540	9.530 129.130	12.700 171.090	9.530 129.130	15.090 294.250	22.230 171.090	22.230 373.830	28.580 451.420	34.930 527.020	41.280 600.630	47.630 672.260	47.630 672.260	4.780 66.570	5.540 77.060		
600.0	24	610.0		6.350 94.530	9.530 141.120	12.700 209.640	9.530 141.120	15.090 255.410	24.610 355.260	24.610 442.080	30.960 547.710	38.890 640.030	46.020 720.150	52.370 808.220	52.370 808.220	5.540 84.160	6.350 96.370		
650.0	26	660.0		7.920 127.360	12.700 202.720		9.530 152.870		12.700 202.720	12.700 202.720									
700.0	28	711.0		7.920 137.320	12.700 218.690	15.880 271.210	9.530 164.850		12.700 218.690	12.700 218.690									
750.0	30	762.0		7.920 147.280	12.700 234.670	15.880 292.180	9.530 176.840		12.700 234.670	12.700 234.670						6.350 120.720	7.920 150.360		
800.0	32	813.0		7.920 157.240	12.700 250.640	15.880 312.150	9.530 188.820	17.480 342.910	12.700 250.640	12.700 250.640									
850.0	34	864.0		7.920 167.200	12.700 266.610	15.880 332.120	9.530 200.310	17.480 364.900	12.700 266.610	12.700 266.610									
900.0	36	914.0		7.920 176.960	12.700 282.270	15.880 351.700	9.530 212.560	19.050 420.420	12.700 282.270	12.700 282.270									
950.0	38	965.0					9.530 224.540		12.700 298.240	12.700 298.240									
1000.0	40	1016.0					9.530 236.530		12.700 314.220	12.700 314.220									
1050.0	42	1067.0					9.530 248.520		12.700 330.190	12.700 330.190									
1100.0	44	1118.0					9.530 260.500		12.700 346.160	12.700 346.160									
1150.0	46	1168.0					9.530 272.250		12.700 351.820	12.700 351.820									
1200.0	48	1219.0					9.530 284.240		12.700 377.790	12.700 377.790									

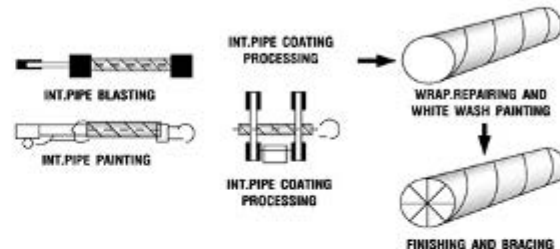
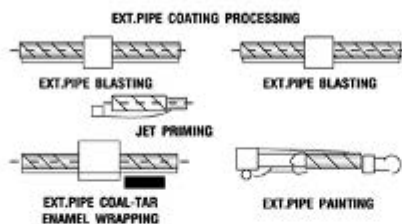
Please check with the manufacturer the availability of the product

SUBMERGED ARC WELDING

PRODUCTION PROCESS



Specification	Products	Production Capacity	
		Outside Diameter	Wall Thickness (mm.)
ASTM A 139	Electrical-Fusion Submerge Arc Welding Steel Pipe	300-3000	4.50-19.10
ASTM A 211	Submerged Arc Welding Steel or Iron Pipe	300-3000	4.50-19.10
ASTM A 252	Welded and Seamless Steel Pipe Piles	300-3000	4.50-19.10
AWWA C 200	Steel Water Pipe 6 Inch and Larger	300-3000	4.50-19.10
AWWA C 203	Coal Tar Enamel Protective Coating for Steel Water Pipe	300-3000	4.50-19.10
AWWA C 205	Cement Mortar Protective Lining and Coating for Steel Water Pipe	300-3000	4.50-19.10
AWWA C 210	Liquid Epoxy Coating for Steel Water Pipe	300-3000	4.50-19.10
JIS G 3443	Coating Steel Pipe for Steel Water Pipe	300-3000	4.50-19.10
JIS G 3444	Carbon Steel Tubes for General Structural Purpose	300-3000	4.50-19.10
JIS G 3457	Submerged Arc Welded Carbon Steel Pipes	300-3000	4.50-19.10
JIS G 3492	Coal Tar Enamel Protective Steel Pipes	300-3000	4.50-19.10
JIS G 3492	Coal Tar Enamel Protective Coating for Steel Water Pipes	300-3000	4.50-19.10
JIS A 5525	Steel Pipes Piles	300-3000	4.50-19.10
BS 534 TIS 427	Steel Pipes . Joints and specials for water and sewage	300-3000	4.50-19.10



Hydrostatic Test Pressure for Steel Pipes

Nominal Diameter	Test Pressure kg./cm. ²		Minimum Duration
	Underground Pipe	Aboveground Pipe	
100-250	50	50	5
300	40	50	5
400	35	50	5
500	30	35	10
600	25	35	10
700-800	20	35	30
900-1500	20	30	30
1800-2100	20	25	30

There shall be no leak

Before coating and lining, each fitting shall be tested to a hydrostatic pressure of at least 15 kg/cm² minutes. There shall be no leak

Available Coating

1. AWWA C203 Coal tar protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape Hot - Applied
2. AWWA C205 Cement - Mortar Protective Lining and Coating for Steel Water Pipe 4 Inch and Larger (Shop Applied)
3. AWWA C210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
4. AWWA C214 Tape Coating Systems for the Exterior of Steel Water Pipelines
5. HOT DIPPED GALVANIZED conforming to JIS H8641, ASTM A123
6. Coating as requested

Nominal Diameter	Outside Diameter of Pipe and Fitting (mm.)	Length of Underground Pipe and aboveground Pipe (m.)	Length of Sleeve Pipe (m.)	Wall Thickness		Cement-Mortar Lining Thickness (mm.)
				Underground Pipe and Sleeve Pipe (mm.)	Aboveground Pipe (mm.)	
100	114.3+/-1.6	-	-	2.65-0.25	4.5-0.25	6+2,-1
150	168.3+/-1.6	6.00+/-0.05	3.0+/-0.05	3.45-0.25	5.5-0.25	6+2,-1
200	219.1+/-1.6	6.00+/-0.05	3.0+/-0.05	4.50-0.25	6.0-0.25	6+2,-1
250	273.0+/-1.6	6.00+/-0.05	3.0+/-0.05	4.80-0.25	6.0-0.25	6+2,-1
300	323.9+/-1.6	6.00+/-0.05	3.0+/-0.05	6.00-0.25	6.0-0.25	6+2,-1
400	406.4+/-1.6	9.00+/-0.05	3.0+/-0.05	6.00-0.25	7.9-0.25	8+3,-2
500	508.0+/-1.6	9.00+/-0.05	3.0+/-0.05	6.00-0.25	7.9-0.25	8+3,-2
600	609.6+/-1.6	9.00+/-0.05	3.0+/-0.05	6.00-0.25	11.1-0.25	8+3,-2
700	711.2+/-1.6	9.00+/-0.05	3.0+/-0.05	6.00-0.25	11.1-0.25	10+3,-2
800	812.8+/-1.6	9.00+/-0.05	3.0+/-0.05	7.90-0.25	12.7-0.25	10+3,-2
900	914.4+/-1.6	9.00+/-0.05	3.0+/-0.05	7.90-0.25	12.7-0.25	10+3,-2
1000	1016.0+/-1.6	See note 1	3.0+/-0.05	9.50-0.25	12.7-0.25	12+3,-2
1100	1117.6+/-1.6	-	3.0+/-0.05	9.50-0.25	-	-
1200	1219.2+/-1.6	See note 1	3.0+/-0.05	11.10-0.25	15.9-0.25	12+3,-2
1300	1320.8+/-1.6	-	3.0+/-0.05	12.70-0.25	-	-
1400	1422.4+/-1.6	-	3.0+/-0.05	12.70-0.25	-	-
1500	1524.0+/-1.6	See note 1	3.0+/-0.05	12.70-0.25	19.1-0.25	12+3,-2
1600	1625.6+/-1.6	See note 1	3.0+/-0.05	15.90-0.25	19.10-0.25	-
1800	1820.0+/-3.0	6.00+/-0.05	3.0+/-0.05	15.90-0.25	25.4-0.25	14+3,-2
2100	2120.0+/-3.0	-	3.0+/-0.05	19.10-0.25	-	-

Note 1 : 6.0+/-0.05 meter or 9.0+/-0.05 meter as approved by Project Engineer
Source : Metropolitan Waterworks Authority of Thailand

Pressure Equivalents

ตารางแปลงหน่วยความดัน

Unit	PSI	kPa	kg/cm ²	cm H ₂ O	feet H ₂ O	inches Hg	mm Hg	inches H ₂ O	Atm.	Bar	mPa
PSI	1	6.894757	0.070307	70.306927	2.306723	2.03602	51.71486	27.68068	0.068046	0.0689476	0.00689
kPa	0.1450377	1	0.0101972	10.19745	0.3345618	0.2952997	7.50061	4.01472	0.0096692	0.01	0.001
kg/cm ²	14.223343	98.06694	1	1,000.03	32.809312	28.95901	735.5588	393.71181	0.9678416	0.9806649	0.09806
cm H ₂ O	0.0142229	0.0980634	0.001	1	0.032808	0.0289581	0.7355372	0.3937	0.0009678	0.0009806	0.00098
feet H ₂ O	0.433515	2.968961	0.0304791	30.48	1	0.882646	22.4192	12	0.029499	0.0296896	0.00298
inches Hg	0.4911542	3.386389	0.0345316	34.53253	1.132957	1	25.4	13.595484	0.0334211	0.0338639	0.00386
mm Hg	0.0193368	0.1333225	0.0013595	1.359554	0.0446046	0.0393701	1	0.535255	0.0013158	0.0013332	0.00013
inches H ₂ O	0.0361263	0.2490819	0.0025422	2.54	0.08333	0.0735539	1.8682683	1	0.0024583	0.0024908	0.000249
Atm.	14.696	101.32535	1.033231	1,033.26	33.8995	29.9213	760	406.794	1	1.0132535	0.1013
Bar	14.5038	100	1.019716	1019.7466	33.4833	29.53	750.0626	401.8596	0.986923	1	0.1
mPa	145.0377	1,000	10.197	10,197.45	334.56	295.299	7500.61	4014.74	9.669	10	1

* Water (H₂O) at standard temperature 68 °F (20 °C) and mercury (Hg) at standard temperature 32 °F (0 °C)

* น้ำ (H₂O) ที่อุณหภูมิมาตรฐาน 68 °F (20 °C) และปรอท (Hg) ที่อุณหภูมิมาตรฐาน 32 °F (0 °C)

This table can be used to calculate pressure unit and also strength and stress transform

ตารางนี้สามารถใช้ในการแปลงหน่วยความดัน และยังใช้กับการแปลงหน่วยความแข็งแรงและความเค้นของวัสดุ (Strength & Stress) ได้ด้วย

Volume Equivalents

ตารางแปลงหน่วยปริมาตร

Unit	US.gallon	Im.gallon	inch ³	ft ³	liter	m ³	barrel
US.gallon	1	0.83267	231	0.13368	3.7853	0.00378	0.02381
Im.gallon	1.2009	1	277.42	0.16054	4.5459	0.00455	0.02859
Inch ³	0.004329	0.003604	1	0.000579	0.0164	0.000016	0.0001
ft ³	7.4805	6.2288	1728	1	28.316	0.02832	0.17813
liter	0.26418	0.21997	61.024	0.0353	1	0.001	0.00629
m ³	264.17	219.97	61,023.74	35.3147	1,000	1	6.2899
barrel*	42	34.977	9702	5.614	158.983	0.15876	1

* Oil barrel (Oil barrel) 1 Barrel = 42 US. Gallons

Volumetric Flow Rate Equivalents

ตารางแปลงหน่วยอัตราการไหล

Unit	GPM(US)	GPM(UK)	ft ³ /min	ft ³ /sec	m ³ /hr	m ³ /min	liter/sec
GPM(US)	1	0.8327	0.1337	0.00223	0.2271	0.003785	0.06308
GPM(UK)	1.201	1	0.1605	0.002676	0.27275	0.004545	0.0758
ft ³ /min	7.481	6.229	1	0.01667	1.699	0.02832	0.4719
ft ³ /sec	448.83	373.7	60	1	101.94	1.699	28.32
m ³ /hr	4.403	3.666	0.5886	0.00981	1	0.01667	0.2778
m ³ /min	0.2642	0.22	35.3147	0.5886	60	1	16.667
liter/sec	15.85	13.2	2.119	0.0353	3.6	0.06	1

Mass Equivalents

ตารางแปลงหน่วยน้ำหนัก (มวล)

Unit	pound	ounce	gram	kg	slug	stone	tonne
pound	1	16	453.6	0.453597	0.031	0.0135	0.0004536
ounce	0.0625	1	28.3495	0.028349	0.0019		
gram	0.0022	0.0353	1	0.001			
kg	2.2046	35.274	1,000	1	0.0685	0.157	0.001
slug	32.174	514.785	14,593.90	14.5939	1	2.29825	0.014594
stone	13.988	223.99	6,350.00	6.35	0.4351	1	0.00635
tonne	2,204.60			1,000	68.5213	157.48	1

Metric Tonne (Tonne) = 1000 kg

US ton (Short Ton) = 0.907185 Metric Tonne UK ton (Long Ton) = 1.01605 Metric Tonne

Length Equivalents

ตารางแปลงหน่วยความยาว

Unit	inch	ft	yard	mile	cm	metre	km
inch	1	0.08333	0.027778		2.54	0.0254	
ft	12	1	0.333333		30.48	0.3048	
yard	36	3	1	0.0005682	91.44	0.9144	0.0009144
mile	63,360	5,280	1,760	1	1,609.344	1.609344	
cm	0.3937	0.032808	0.010936		1	0.01	
metre	39.3701	3.28084	1.093613	0.0006214	100	1	0.001
km	39,370	3,280.8	1,093.61	0.62137	100,000	1,000	1

Area Speed Equivalents

ตารางแปลงหน่วยความเร็ว

Unit	mm/s	ft/min	cm/s	ft/s	m/s
mm/s	1	0.19685	0.1	0.003281	0.001
ft/min	5.08	1	0.508	0.016667	0.00508
cm/s	10	1.9685	1	0.032808	0.01
ft/s	304.8	60	30.48	1	0.3048
m/s	1,000	196.85	100	3.2808	1

Power Equivalents

ตารางแปลงหน่วยกำลัง

Unit	pound	ounce	gram	kg	slug
HP	1	550	745.7	0.7457	2.544
Ft-lb/sec	0.00182	1	1.3558	0.00136	4.626
Watt	0.00134	1	1	0.001	3.412
kW	1.34	737.6	1,000	1	3.412
Btu/hr	0.00039	0.2161	0.2931	0.00029	1

Area Equivalents

ตารางแปลงหน่วยพื้นที่

Unit	Inch ²	ft ²	acre	cm ²	m ²
Inch ²	1	0.006944		6.4516	0.0006452
ft ²	144	1		929.0304	0.0929
acre		43,560	1		4,047
cm ²	0.155	6.2288		1	0.0001
m ²	1,550.00	10.76391	0.000247	10,000	1

Density Equivalents

ตารางแปลงหน่วยความหนาแน่น

Unit	lb/inch ³	lb/ft ³	gram/cm ³	kg/m ³	slug/ft ³
lb/inch ³	1	1,728	27.6799	27,679.90	53.708
lb/ft ³	0.0005787	1	0.01602	16.01846	0.31081
gram/cm ³	0.03613	62.4281	1	1,000	1.9403
kg/m ³	0.0000361	0.06243	0.001	1	0.00194
slug/ft ³	0.019	32.17	0.51538	515.379	1



Note

A series of horizontal dashed lines for taking notes.

สำนักงานกรุงเทพฯ

บริษัท รวมกิจ อินเตอร์เนชั่นแนล จำกัด

138/27 อาคารจุฬาลงกรณ์ เซ็นเตอร์

ชั้น 12C ถนนนเรศ แขวงสี่พระยา

เขตบางรัก กรุงเทพมหานคร 10500

โทร. 0-2267-3365-76

แฟกซ์. 0-2267-3248-9

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บริษัท รวมกิจมาร์เก็ตติ้ง จำกัด

138/27 อาคารจุฬาลงกรณ์ เซ็นเตอร์

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แฟกซ์. 0-2267-3248-9



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